



DEPARTMENT OF ENVIRONMENTAL QUALITY

KATHLEEN BABINEAUX BLANCO

GOVERNOR

MAR 14 2007

MIKE D. McDANIEL, Ph.D.

SECRETARY

Certified Mail 7004 1160 0001 9949 7707

Mr. Bill Smith, Parish Administrator
DeSoto Parish Police Jury
Post Office Box 898
Mansfield, Louisiana 71052

RE: Technically Complete Determination
Mundy Landfill - Modification #2 for Permit P-0035R1
AI# 19803/D-031-1827/P-0035R1/PER20060003
DeSoto Parish

Dear Mr. Smith:

We are in receipt of the finalized copies of your permit modification #2 dated February 9, 2007. After review of these documents, we have determined that your modification is technically complete and acceptable for public review.

The Environmental Assistance Division will distribute copies of your application for public review and place public notices in the appropriate newspapers in accordance with LAC 33:VII.513.F.3. Please contact Ms. Soumaya Ghosn at (225) 219-3276 for the date of publication and the dates for the comment period. At the conclusion of the comment period, we will consider all comments and render a permit decision regarding your application.

Please continue to reference your Agency Interest and Facility Identification Numbers on all future correspondence regarding this matter. If you have any questions, please contact Ms. Sonya Eastern of the Waste Permits Division at (225) 219-3551.

Sincerely,

Chuck Carr Brown, Ph. D., Assistant Secretary
Office of Environmental Services
Permits Division

se

ENVIRONMENTAL SERVICES

: PO BOX 4313, BATON ROUGE, LA 70821-4313

P:225-219-3181 F:225-219-3309

WWW.DEQ.LOUISIANA.GOV

MAIN FILE**STE****Soil Testing Engineers, Inc.**316 HIGHLANDIA DRIVE (70810) • P.O. BOX 83710 (70884) • BATON ROUGE, LOUISIANA
PHONE (225) 752-4790 • FAX (225) 752-4878 • www.STEofLA.comGORDON P. BOUTWELL, JR., Ph.D.
CHAD M. POCHÉ, MS
KEITH SPAMPNETO
RICARDO de ABREU, Ph.D.original to IOSWSm
copy to SW/GI/Townsel
AVGREGISTERED PROFESSIONAL ENGINEERS

February 9, 2007

Louisiana Department of Environmental Quality
Office of Environmental Services
P.O. Box 4313
Baton Rouge, LA 70821-4313Attn: Mr. Bijan Sharafkhani, P.E.
Administrator, Waste Permits DivisionRe: Modification #2 to Renewed Permit (P-0035R1) - Final Copies
Mundy Landfill – DeSoto Parish
D-031-1827/AI# 19803/PER 20060003

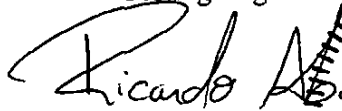
Dear Mr. Sharafkhani:

As authorized by the DeSoto Parish Police Jury, we are submitting six (6) bound copies of the complete modification application as requested on your letter dated January 22, 2007. This final version of the Permit Modification #2 incorporates all previously accepted revisions due to the Notices of Deficiency process to the original submitted application.

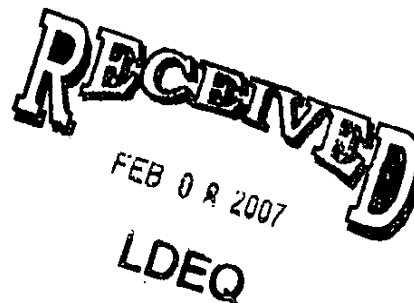
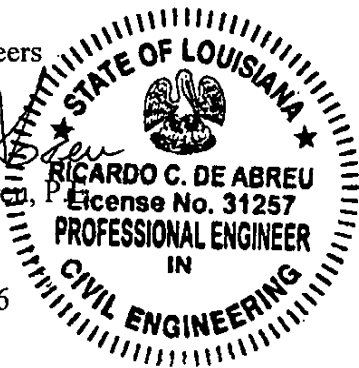
Please feel free to contact the writer at 225-752-4790 should you have any questions. Both the Parish and its consultants appreciate the courtesy and helpfulness you and your staff have extended to them during the review process, and look forward to your prompt and favorable review of the attached document.

Sincerely,

Soil Testing Engineers


 Dr. Ricardo de Abreu, P.E.
 Senior Engineer

Copies submitted: 6



LDEQ RECEIPT

7 FEB -9 PM 2:45

**APPLICATION FOR
MAJOR MODIFICATION NO. 2
CELL CD&T-N**

TO

**SOLID WASTE DISPOSAL
STANDARD PERMIT P-0035R1**

ISSUED TO

DESOTO PARISH POLICE JURY

FOR

**MUNDY LANDFILL
FACILITY NO. D-031-1827
AGENCY INTEREST NO. 19803**

**SUBMITTED BY:
SOIL TESTING ENGINEERS, INC.
BATON ROUGE, LOUISIANA**

February 9, 2007

**PERMIT MODIFICATION NO. 2
CELL CD&T-N – PERMIT P-0035R1**

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**PERMIT MODIFICATION NO. 2
CD&T-N CELL – PERMIT P0035R1**

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APPLICATION**

- B-1** (Deleted)
- B-2** Part II – Supplementary Information (Select Responses to LAC 33:VII.521)
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ATTACHMENT C – ENVIRONMENTAL ASSESSMENT STATEMENT

**ATTACHMENT D – NEW APPENDIX T TO THE PERMIT RENEWAL
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APPENDIX T: CELL CD&T-N

T-1 ENGINEERING CALCULATIONS

- T-1a** Volumetric and Surface Area Estimates
- T-1b** Slope Stability Analyses
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- T-1d** Soil Loss Calculations
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T-2 2006 PERMIT DRAWINGS


- STE-T1** Bottom of Cell
- STE-T2** Conceptual Bottom of Final Cover
- STE-T3** Conceptual Cross-Section: Station N92+50
- STE-T4** Details

Media Type (check one)

Agency Interest Number: 19803

Hazardous Waste ☐ Air ☐
 Solid Waste ☒ Water ☐
 Radiation Licensing ☐

Is this a copy of a previously submitted form? Yes ☒ No ☐If yes, indicate the original submittal date: January 11, 2002If yes, indicate the original permit number: P-0035

Department of Environmental Quality Permits Division P.O. Box 4313 Baton Rouge, LA 70821-4313 (225) 219-3181		Addendum to Permit Applications per LAC 33:I.1701			
Please Type Or Print	Company Name		<input checked="" type="checkbox"/> Owner	Per Permits Division Use Only	
	DeSoto Parish Police Jury		<input type="checkbox"/> Operator		
	Parent Company (if Company Name given above is a division)				
	Plant name (if any)				
	Muddy Landfill D-031-1527				
	Nearest town	Parish where located			
	Mansfield, Louisiana	DeSoto Parish			

Use attachments to provide the required information. "NA" is not an acceptable answer. If a particular section does not apply to you, explain why.

1. Please provide a list of the states where you, as applicant*, have federal or state environmental permits identical to, or of a similar nature to, the permit for which you are applying. Louisiana

*This requirement applies to all individuals, partnerships, corporations, or other entities who own a controlling interest of 50% or more in your company, or who participate in the environmental management of the facility for an entity applying for the permit or an ownership interest in the permit.

2. Do you owe any outstanding fees or final penalties to the Department? No ☒ Yes ☐ If yes, please explain.
3. Is your company a corporation or limited liability company? No ☒ Yes ☐ If yes, attach a copy of your company's Certificate of Registration and/or Certificate of Good Standing from the Secretary of State.

Certification:

I certify, under provisions in Louisiana and United States law which provide criminal penalties for false statements, that based on information and belief formed after reasonable inquiry, the statements and information contained in this Addendum to the Permit Application, including all attachments thereto are true, accurate, and complete.

Responsible Official

Name	B. D. Mitchell
Title	President
Company	DeSoto Parish Police Jury
Suite, mail drop, or division	
Street or P.O. Box	P.O. Box 698

City	State	Zip
Mansfield	LA	71052
Business phone		
318-872-0738		
Signature of responsible official(s)		
<i>B. D. Mitchell</i>		
Date		
6/19/06		

June 19, 2001

June 19, 2001

LDEQ
DEPARTMENT OF
ENVIRONMENTAL
QUALITYMundy Landfill
Permit Renewal ApplicationCERTIFICATION

I certify under penalty of law that I have personally examined and I am familiar with the information submitted in this permit renewal/major modification application, and that the facility as described in this permit modification meets the requirements of the Solid Waste Rules and Regulations. I am aware that there are significant penalties for knowingly submitting false information, including the possibility of fine and imprisonment.

B. D. Mitchell
Mr. B. D. Mitchell, President
DeSoto Parish Police Jury

6-09-06
Date

1.0 INTRODUCTION

On April 30, 1985, the Louisiana Department of Environmental Quality (LDEQ) issued Standard Permit P-0035 allowing the DeSoto Parish Police Jury to operate a Type II municipal solid waste facility near the town of Mansfield, Louisiana. The site is located in Section 3, Township 12 North, Range 12 West, at approximately north latitude 32 degrees 03 minutes 30 seconds and west longitude 93 degrees 35 minutes 30 seconds. The permit for the Mundy Landfill facility was renewed by LDEQ in 2004 under the number P-0035R1. This renewal permitted the facility to accept Type I waste. A general location map for the facility is presented in Attachment A. This request is for the second modification to that permit.

The Permit Renewal Application (PRA) specifically states that the facility can receive Type III wastes (See Part I, Appendix A of the PRA). However, it also states that Type III wastes will go to the 4.4-acre CD&T area in the south (now designated as CD&T-S) illustrated on the various PRA drawings (See Drawing DSW-GP-05A). In order to provide the most environmentally sound and economical disposal of their solid wastes, the DeSoto Parish Police Jury wishes to use the "valley" between the tops of the existing Type I/II cells (Cells I-III and VI) as a Type III (construction debris, yard waste, trash, etc.) disposal area. The recently completed Cell VI has a liner that meets current standards, LAC 33:VII.521.F.4.b. Cells I, II, and III have liners consisting of 3 feet of recompacted clay. Cells I, II, and III have been completed and capped. The fill operations for Cell VI have been completed with the exception of the final cover. Cell VII is currently receiving Type I/II waste for disposal.

This permit modification is required by the SWRR LAC 33:VII.517 in order to:

- Increase the permitted capacity of the facility with a new, additional Type III cell location; and,
- Allow an alternative Cell VI Capping Plan.

The following sections present this modification request and address the permitting and design items associated with the proposed changes. Environmental and design considerations are discussed. Necessary revisions to the Permit Renewal Application have been identified and are presented in Attachment B. Revisions to language in the Permit Renewal Application occurring as a result of this modification are presented in the form of strikethrough text, illustrating old language to be removed and underlined text illustrating new proposed verbiage, Attachment B. The Environmental Assessment Statement (EAS) required by SWRR 33:VII.523.A-E, Louisiana Revised Statute 30:2018.B has been prepared and is presented in Attachment C. Drawings and engineering calculations supporting the design of Cell CD&T-N are presented in Attachment D.

2.0 MODIFICATION NO. 2 REQUEST

Modification No. 2 proposes two changes to the Mundy Landfill solid waste permit. One change is to increase the permitted capacity for Type III wastes at the Mundy Landfill by approximately 246,000 tons in a vertical expansion over Cells I, II, III and VI. The second change is to modify the final capping plan for Cell VI with a final capping plan that will serve and be compatible for both Cell VI and Cell CD&T-N.

2.1 GENERAL DESCRIPTION

2.1.1 CD&T-N Cell – Location. As presented in Section 1.0, the new CD&T Area, Cell CD&T-N, represents an expansion in Type III waste capacity. Cell CD&T-N is positioned in the valley between existing Cells I, II, III, and VI. The liner, leachate collection and other landfill systems for the pre-existing facilities are in agreement with LDEQ regulations and practice. Cells I, II, and III have liners consisting of three feet of recompacted clay, while Cell VI has a liner that meets Subtitle D standards. Drawing STE-T1 in Attachment D shows the cell bottom of the new CD&T-N cell in the valley between Cells I, II, III and VI.

2.1.2 CD&T-N Cell – A Vertical Expansion. The new Type III disposal area, Cell CD&T-N, will cover approximately seven acres, within the valley between Cells I, II, III and VI., see Drawing STE-T2. This expansion raises the vertical height to approximately 335 feet NGVD. Drawing STE-T3 presents a conceptual cross-section of the new Type III cell and the adjacent Type I/II cells at Station N 92+50. The net gain in permitted airspace due to this proposed new CD&T area is 332,000 cubic yards (246,000 tons). Approval of Modification No. 2 will bring the total airspace, Types I, II, and III, to about 3,830,000 cubic yards (2,585,000 tons), which is below the threshold where an active gas system is required under LDEQ regulation (Chapter 30, subchapter A, Section 3003).

2.1.3 CD&T-N & Cell VI – Final Cover. Cell CD&T-N will cover a portion of Cell VI which, under the current plan is to be capped with a composite clay and synthetic cover. Cell CD&T-N will also require a final cover but only clay. This modification proposes to apply a final cover of two feet of 1×10^{-7} cm/sec clay and six inches of topsoil over the side slopes of Cell VI that are not to be covered by Cell CD&T-N and over all of Cell CD&T-N. The slopes of CD&T-N flatter than 4(H):1(V) which also overlie Cell VI will have an additional component of 60-mil HDPE geomembrane between the clay and topsoil components. This cover system, approved for Cell VII in Modification No. 30, is currently incorporated into the Permit Renewal Application. This synthetic component over the flatter slopes will offer additional protection against infiltration of precipitation. In summary, the final closure cap will consist of two feet of clay compacted to the permeability standard of 1×10^{-7} cm/sec, a 60-mil HDPE geomembrane over slopes that are flatter than 4(H):1(V), and a vegetative topsoil layer. The cells will be seeded with native grass(es) after the closure cover is installed and inspected by the LDEQ.

2.2 EXISTING CELL LINERS/CONTACT STORMWATER COLLECTION SYSTEM

2.2.1 Existing Liner/Cover Systems. The proposed Cell CD&T-N straddles the boundaries separating Cells I, II, III, and VI and will overlie portions of these cells. Cells I, II, and III are closed with a two-foot clay cover; Cell VI is covered with an interim cover. The settlement produced in the waste and the in-situ soil beneath the existing cells by the weight of the additional Type III waste will not adversely impact the liners nor the final, in-place covers for the existing cells (refer to Attachment D).

2.2.2 Contact Stormwater Collection. A slotted, 12-inch diameter HDPE pipe placed along the centerline of the valley between the existing cells, at the bottom of Cell CD&T-N, will provide subsurface drainage for the CD&T area during fill operations and after closure, Drawing STE-T1 presented in Attachment D. The slope of this pipe will follow the natural contours of the valley, providing drainage to the north and southwest perimeter of the impacted cells. The natural grade varies from two percent to seven percent. The pipe will be wrapped with a filter fabric, Drawing STE-T4 in Attachment D.

2.2.3 Quality Assurance. All the construction cited above will be performed under Quality Control/Quality Assurance following the LDEQ-approved Quality Assurance/Quality Control Plan, presented in Appendix K of the Permit Renewal Application.

2.3 FINAL COVER

The final cover for Cell CD&T-N will be the same as that required in the LDEQ-approved closure plan for Cell VII (See Response to LAC 33:VII.521.J2.a in the approved Permit Renewal Application). The side slopes will not be steeper than 1(V):3(H) and the top slope no flatter than 4%. The final cover system will include diversion berms and letdown chutes to control stormwater and erosion. The final cover will consist of, from top to bottom:

- Vegetative Layer – A nominal six-inch thick layer of soil capable of sustaining plant growth.
- Geotextile [where slope is flatter than 1(V):4(H) and overlies Cell VI.]
- 60-mil HDPE Geomembrane [where slope is flatter than 1(V):4(H) and overlies Cell VI.]
- At least two feet of clay soil, compacted in nominal six-inch lifts so as to achieve a hydraulic conductivity of 1×10^{-7} cm/sec or less.
- Existing interim cover.

The final cover will be constructed following the LDEQ-approved Quality Assurance/Quality Control Plan, presented in Appendix K of the Permit Renewal Application. Drawing STE-T2 in Attachment D, presents the conceptual contour lines for the base of the cover system over Cell

CD&T-N.

2.4 GAS COLLECTION SYSTEM

The west perimeter of Cell CD&T-N ends at the line of existing gas collection system for Cells I, II, and III. Cell CD&T-N fill will sit on a significant portion of Cell VI with only interim cover. A conceptual gas collection system to address the ventilation needs for Cell VI are shown in Drawing STE-T2 in Attachment D. It includes a header line and vents along the eastern edge of Cell CD&T-N. These header pipes and vents will be over the crest of Cell VI. The facility's permitted capacity does not require an active gas collection/disposal as per Chapter 30, Subchapter A, Section 3003.

3.0 ENVIRONMENTAL CONSIDERATIONS

The environmental considerations have been evaluated by the facility's consultant, Soil Testing Engineers, INC. (STE). There will be no environmental changes from those environmental concepts and requisites set forth in the Permit Renewal Application which was approved by LDEQ. An Environmental Assessment Statement (EAS) for Cell CD&T-N is included as Attachment C. It is in the form of Responses to LAC 33:VII.523. In summary:

1. Adverse environmental effects have been avoided to the maximum extent possible through design, operation, and monitoring.
2. The benefit to the citizens of DeSoto Parish is continued, environmentally sound disposal of their solid wastes. The benefit outweighs the minor environmental impact of the CD&T cell.
3. There are no alternative projects which would offer more protection to the environment than Cell CD&T-N without unduly curtailing its benefits to the citizens of DeSoto Parish.
4. No alternative facilities would offer more protection to the environment than Cell CD&T-N without unduly curtailing its benefits to the citizens of DeSoto Parish.
5. No further mitigating measures would offer more protection to the environment than the new CD&T cell without unduly curtailing its benefits to the citizens of DeSoto Parish.

4.0 DESIGN CONSIDERATIONS

STE evaluated several engineering issues of importance to the Cell CD&T-N configuration that consider a tie-in between Cells I, II, III and VI. The analyses included slope stability, settlement, erosion control and surface water management,

4.1 SLOPE STABILITY

Cell CD&T-N has a maximum elevation of about +335 feet NGVD. It is situated between and ties into the contours of the adjoining Type II cells. Analyses were made for the stability of the different slope geometry formed by the combination of Cell CD&T-N and the existing Type II cells. The final slope is a 3H:1V with a minimum of four percent at the crest to promote drainage. The final contours for Cell CD&T-N tie into the contours from the most recent topographic survey (Polaris Services LLC, 12/02/05).

The stability of the Cell CD&T-N slopes was analyzed at several stations for the maximum cell height and with slight variations in the underlying soil strata. The geology has been well documented in previous permitting documentation. The following results for the slope stability sections yielded the factors of safety shown for this vertical expansion.

Section	Safety Factor Undrained Conditions
Station N91+00	2.103
Station N92+00	2.091
Station N92+50	2.053

It should be noted that the undrained condition implies instantaneous filling of all cells to the maximum height, a physical impossibility. However, the safety factors easily exceed the LDEQ-preferred minimum value of 1.5. The soil and waste conditions, slope geometry, and critical potential failure surface are illustrated graphically on the figure provided with the slope failure analysis presented in Attachment D.

4.2 SETTLEMENT

The weight of Cell CD&T-N will produce further settlement in the waste existing in the three Type I/II cells. The final cap/cover has been completed for Cells I, II, and III. The final cap consists of two feet of recompacted clay with a minimum of six inches of vegetative soil. The impact on the final cap from the additional settlement of the garbage within these cells has been checked, with respect to strain in bending and elongation, and found to be within acceptable limits. The stress criterion for bending was also found not to be exceeded. The integrity of the final cover for Cell I, II, and III will not be compromised by the additional load. Currently, the fill activities in Cell VI have reached the permitted height and the cell is covered by interim cover. The final cover has not

been placed over Cell VI. However, the stress-strain produced in the interim cover is not excessive. The hyperbolic model for settlement-time and the results of large scale compressibility tests on garbage conducted by the University of New Orleans for initial settlement were used in estimating the maximum settlements, see Attachment D.

The underlying natural soils at the site of Cell CD&T-N are stiff and relatively incompressible. However, the effects of settlement on the Subtitle D liner in Cell VI and the leachate pipe were evaluated. Standard soil mechanics methodologies were employed, see Attachment D. Load-settlement characteristics of the thick stiff clays were determined from previous tests on soil samples taken from the site.

Stress-strain criterion for the recompacted clay liner and stress criterion for the synthetic component of the liner system for Cell VI were evaluated and found to be acceptable. Also, the leachate collection system will maintain a positive drainage after settlement. Estimates of changes in the slopes of the leachate pipes were minimal and will not affect drainage, see Attachment D.

4.3 EROSION CONTROL

The Universal Soil Loss Equation was used in estimating the potential for erosion of the final cover. Calculations of the average annual soil loss are within the acceptable tolerance values, see calculations presented in Attachment D.

4.4 CONTACT STORMWATER DRAINAGE

The area to be occupied by Cell CD&T-N lies in a valley between Cells I, II, III and VI. The side-slopes of the existing cells drain into the valley which then slopes toward the north where the stormwater runoff is collected in holding ponds. In order to provide drainage during filling operations and to assist in diverting infiltration water from reaching the Type I/II cell areas, a collection pipe was sized. A slotted HDPE pipe, wrapped with geotextile material will be placed along the natural grade of the valley, see Drawings STE-T1 and STE-T4 in Attachment D. In sizing the pipe, drainage estimates were made using the Rational Equation with a storm frequency of 10 years for that area of the state. The LaDOTD Hydraulics Manual and information was used in estimating flow quantities. The irregular length of the valley was divided into three sections for estimating flow rates. Based on calculations, a 12-inch pipe was selected, see Attachment D. The structural stability of the pipe under maximum waste load was verified.

4.5 GAS COLLECTION SYSTEM

A series of eight shallow collection wells will be tied together with an eight-inch, slotted HDPE header pipe. They will form a passive collection/venting system installed in the portion of Cell VI that will not be covered by Cell CD&T-N. The system will be approximately 500 feet in length

*Mundy Landfill
Modification No. 2*

along the surface intersection of Cell CD&T-N and Cell VI, see Drawing STE-T2 and STE-T4 presented in Attachment D.

5.0 SUMMARY

STE is submitting Permit Modification No. 2 on behalf of and as approved by the DeSoto Parish Police Jury. The modification proposes the location, design and construction of a new Type III cell, Cell CD&T-N, and a capping plan that modifies the final cap for Cell VI. The proposed final cover is more than is required for a typical CD&T cell but ,because it will also close Cell VI, a composite cover is proposed.

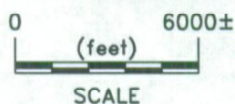
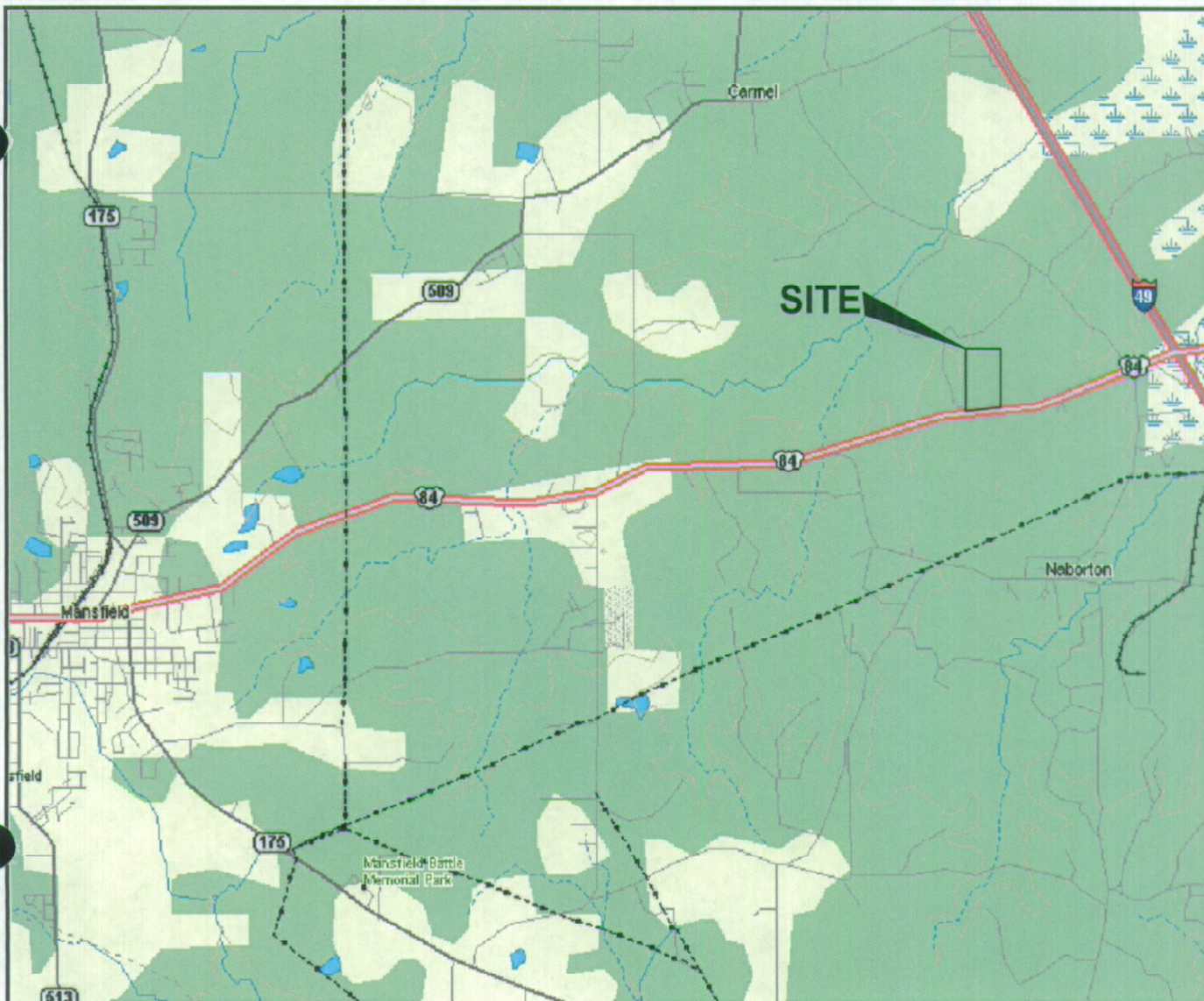
The impact of this modification on the environment and operations of the landfill has been evaluated. There will be no adverse environmental changes from the environmental concepts and requisites set forth in the Permit Renewal Application and as approved by the LDEQ. Design considerations include settlement of the foundation, slope stability, erosion and surface water management. These issues were evaluated and the engineering analyses demonstrate that all engineering parameters investigated were within recommended norms. The location of Cell CD&T-N is within the currently permitted area whose geology has been well established. Necessary revisions to the Permit Renewal Application have been identified updated and are presented in Attachments B. An environmental assessment for Cell CD&T-N is presented in Attachment C. A new appendix, Appendix T, will be added to the Permit Renewal Application and will contain pertinent information for Cell CD&T-N. This new appendix is presented herein as Attachment D.

*Mundy Landfill
Modification No. 2*

ATTACHMENT A

LOCATION MAP

Feb 08, 2007 - 9:22am



**MUNDY SANITARY
LANDFILL**
MANSFIELD, LOUISIANA

for
**DESOTO PARISH POLICE
JURY**
MANSFIELD, LOUISIANA

JONES ENVIRONMENTAL, INC.
SHREVEPORT, LOUISIANA



STE

Soil Testing Engineers, Inc.

Baton Rouge, LA Jefferson, LA Biloxi, MS

Project Engineer: **K. McNamara** Drawn by: **DMS** Checked by: *[Signature]*

File No.: **05-1157** Date: **6-09-06** Attachment: **A**

Title:
GENERAL LOCATION MAP

REFERENCE:
USGS Quadrangle Maps of Bayou
Pierre Lake, LA, 1992 edition and
Mansfield, LA, 1980 edition.

*Mundy Landfill
Modification No. 2*

ATTACHMENT B

REVISIONS TO THE ORIGINAL PERMIT RENEWAL APPLICATION

- B-1** (Deleted)
- B-2** Part II – Supplementary Information (Select Responses to LAC 33:VII.521)
- B-3** Environmental Assessment Statement (EAS)
- B-4** Appendix L: Closure Plan
- B-5** Appendix I: Financial Assurance

*Mundy Landfill
Modification No. 2*

ATTACHMENT B-1

(Deleted)

*Mundy Landfill
Modification No. 2*

ATTACHMENT B-2

Part II – Supplementary Information (Select Responses to LAC 33:VII.521)

§521.B. Facility Characteristics. Standards concerning facility characteristics are contained in LAC 33:VII.709.B (Type I and II facilities), LAC 33:VII.717.B (Type I-A and II-A facilities), and LAC 33:VII.719.B (Type III facilities). A facility plan, including drawings and a narrative, describing the information required below must be provided.

§521.B.1. The following information is required for all facilities:

§521.B.1.a Elements of the process or disposal system employed, including, as applicable, property lines, original contours (shown at not greater than five-foot intervals), buildings, units of the facility, drainage, ditches and roads;

The property is described on drawing **DSW-GP-02**. It consists of a 62-acre parcel of land, roughly rectangular in shape. Drawings **DSW-GP-05A** and **DSW-GP-05B** illustrate the site facilities layout from 1984 to 1996 and the site improvements constructed in 1997. **Sheet STE-4** presented in **Appendix Q** shows the site conditions as of 2002. As shown on drawing **DSW-GP-05B** and **Sheet STE-4**, approximately 35 acres have been used for waste disposal. There are five non-Subtitle D putrescible waste disposal cells, designated Cells I through V, all of which were closed in 1997; two putrescible waste disposal cells (Cell VI and Cell VII, Phase 1), which meets the Subtitle D regulations and replaces the five closed cells; a two non-putrescible waste disposal cells, called CD&T-S and CD&T-N (~~the Construction Debris and Trash (CD & T-S) Area~~, which was also closed in 1997 and was then capped and re-opened in 1998); and, two asbestos disposal cells, ASB1 and ASB2. On-site borrow operations were originally performed in Borrow Areas B1 and B2, but have since been shifted to an off-site 14-acre parcel contiguous to the western property line of the landfill property.

Prior to the construction of the landfill, the site sloped downward steeply from southeast to northwest, as shown on drawing **DSW-GP-03**. Construction of the landfill was performed in such a manner as to maintain the original drainage pattern, as indicated on drawing **DSW-SW-03**, so the majority of the site runoff exits the property at three points at the north end of the facility. These points, along with the other site discharge point, are monitored according to the landfill's two water discharge permits, and are shown on this drawing. Drainage ditches have been installed on both sides of the access road, with outfall into a sedimentation pond, and the site has been graded to divert *uncontaminated storm runoff around the disposal cells and off-site without treatment*.

Where necessary, diversion berms and ditches (see drawing **DSW-GP-26**) have been installed to channel runoff around the active disposal areas, to reduce the amount of contaminated water requiring treatment. These features were approved by the LDEQ in the initial permit process in 1984 for Mundy Landfill, and have been successful over the 12-year history of the facility in protecting the disposal cells, minimizing the volume of wastewater requiring treatment, properly controlling, treating, and monitoring the wastewaters generated, and maintaining the landfill in operating condition.

Original construction consisted of an office building and scales at the entrance at the southeast corner

of the property; the primary access road; an equipment washpad; a sedimentation pond for desiltation of uncontaminated storm runoff; an oxidation pond for treatment of contaminated site wastewater; Cells I - IV; the southern CD&T area CD&T-S; and the perimeter barrier (see drawing **DSW-GP-05A**). Cell V was added in 1992. Cell VI, its associated treatment plant expansion, and access road relocation were constructed in 1997 (see drawing **DSW-GP-05B**). Construction of Cell VII, Phase I was completed in 2003.

The office building and scales provide the control of all waste brought into the landfill. The scales are situated immediately outside the operator's window to allow observation of all vehicles and access for the random inspections to prevent the entry of unauthorized wastes into the site. Two way scales allow the monitoring of waste quantities, with the ability to weigh vehicles both entering and leaving the site. The building houses the scale operating and monitoring equipment, which records all data concerning incoming wastes.

The road system is detailed on drawing **DSW-GP-21**. The primary access road was originally a flexible pavement design road consisting of asphalt placed over a prepared soil cement base course, extending from the site entrance at U.S. Highway 84 to the equipment washpad at the northwest corner of the site. Most of it was relocated and replaced by a surface aggregate roadway as part of the Cell VI construction. Refer to drawings **DSW-GP-05A** and **DSW-GP-05B**. Construction of Cell VII, Phase 1 in 2003 included a crushed-stone surfaced access road. This road improvement created a true perimeter access system at the facility. The new road improved traffic control by allowing for one-way disposal traffic.

The equipment washpad is a concrete apron, to which all waste-hauling vehicles and all landfill equipment are routed for washing prior to leaving the site. Its location adjacent to the original sedimentation pond allows the pond water to be used for washing. It is graded and curbed to prevent dirty water from running off onto the ground, with interception by a drainage inlet which is connected to the treatment plant. All wastewater is channeled to the plant for treatment prior to its discharge from the landfill. A building at the washpad houses the equipment, and a power line and small water service line were installed along the primary access road to the washpad to provide the required facilities.

The sedimentation ponds de-silt all uncontaminated site storm runoff before allowing it to exit the property. Overland runoff from the east side of the site and runoff from the borrow areas and newly constructed disposal cells is diverted via drainage ditches to the ponds for detention, to allow the fine clay and sand particles to settle out. Drainage ditches flow into the ponds, and a spillway is provided in each pond for discharge. The ability to drain the ponds is also a feature.

The original CD&T (non-putrescible waste disposal) Area, now referred to as CD&T-S, is depicted on drawings **DSW-GP-05A**, **DSW-GP-05B** (both in **Appendix N**) and **Sheet STE-1** (in **Appendix Q**). CD&T-N is illustrated on drawings in Appendix T. These cells It provides for separate disposal of non-putrescible waste, which formerly could be performed in an unlined disposal cell, preserving valuable disposal space in the six putrescible waste disposal cells for materials which must be deposited there. Concerns expressed by the LDEQ Solid Waste Division (SWD) that

putrescible wastes had been deposited in CD&T-S resulted in the capping of the cell at the end of 1997 and its re-opening in 1998. The lack of a composite liner in the CD&T Area necessitated its capping and closure in 1997. Construction of a liner in the area allowed resumption of disposal of non-putrescible waste in 1998.

The putrescible waste disposal cells are described in the appropriate sections of this document. Briefly, the five non-Subtitle D cells (Cells I - V) comprise approximately 27 acres of the landfill site and are expected to contain 348,000 tons of waste materials upon closure at the end of 1997. These five cells have an estimated bottom depth at elevation 199.00 Mean Sea Level, as indicated on drawing **DSW-GP-25**, and a maximum height for waste disposal of 300.00 MSL. Native clay materials compacted to a maximum permeability of 1×10^{-7} cm/sec are used for the cell bottom liner (three feet thick) and final cap (two feet thick). Leachate collection piping was placed above the bottom liner and sloped to the cell perimeters, where it penetrates the compacted clay and was connected to the leachate transmission piping which extended to the treatment plant. The leachate transmission piping was removed during the construction of Cell VII, Phase 1. The leachate lines protruding from Cells II, III, and IV are connected to the leachate collection lines in Cell VII, Phase 1. The liner penetration includes the placement of anti-seep collars to prevent leachate escape from the cell by seepage along the pipe. Cell V leachate is collected in a manhole and pumped to a storage tank as needed. A separate sewer for contaminated stormwater was also installed and used for 11 years, but was abandoned, plugged, and partially removed in 1997 as part of the Cell VI construction. In 2003, the abandoned stormwater sewer and leachate transmission piping was removed.

The closure of Cells I - V was made possible by the construction of Cell VI, a disposal area which meets the updated SWRR and the USEPA Subtitle D standards. Cell VII, Phase 1 was constructed in 2003 as Cell VI was reaching capacity. Cell VI and Cell VII, Phase 1 are each eight acres in area. Cell VI has bottom and top elevations similar to Cells I - V, and is designed for disposal of 166,450 tons of refuse. Cell VII, Phase 1 is built partially over Cells I-IV and partially on virgin ground. The liner of Cell VI and the "bottom" portion of Cell VII, Phase 1 is a composite of three feet of compacted clay from the local borrow area meeting the maximum permeability requirements of 1×10^{-7} cm/sec, a 60-mil high density polyethylene (HDPE) geomembrane, and an eight-ounce filter fabric, all installed under a quality assurance/quality control program which maintained construction according to the design and the SWRR. The leachate collection piping is installed above the composite liner and within a gravel and filter fabric envelope for fines filtration. A 12- to 18-inch thick layer of sand (cell floor) or soil (side slopes) overlays the cell composite liner to provide additional fines and solids filtration and liner protection. The "upper" portion of Cell VII, Phase 1 is lined with an alternate liner. The alternate liner consists of a geocomposite to promote gas migration, overlain by a minimum of 12 inches of compacted clay liner (permeability not more than 1×10^{-7} cm/sec), a geosynthetic clay liner, a 60-mil HDPE liner, a geotextile cushion fabric, and a 12-inch thick soil protective cover. The final closure cap will consist of two feet of clay compacted to the permeability standard of 1×10^{-7} cm/sec, a 60-mil HDPE geomembrane over slopes that are less than 6:1, and a vegetative topsoil layer.

The treatment plant originally consisted of a single oxidation pond with a surface area of approximately one third of an acre. While this lagoon consistently met the effluent requirements of

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the discharge permits issued to the facility (see **Appendix E**), there was insufficient detention volume to accommodate the 25-year, 24-hour design storm runoff from the active disposal area. For this reason, and to further improve the quality of the effluent, the plant was expanded in 1997. The oxidation pond was re-built and two polishing ponds were installed adjacent to it, the three ponds being operated in series as facultative lagoons. The reconstruction doubles the surface area of the plant and allows the plant to operate at a shallower depth than originally (three feet vs. five feet), both features of which will improve the efficiency of the plant and the quality of its discharge; enables individual lagoons to be removed from service for maintenance without disrupting plant operations; and provides for detention of contaminated storm runoff above the leachate detention level.

§521.B.2. The following information is required for Type I and II facilities:

§521.B.2.a. Areas for isolating nonputrescible waste or incinerator ash, and borrow areas;

Individual loads of waste containing only non-putrescible materials ~~are have been~~ disposed of in the unlined Construction Debris and Trash (~~CD & T~~) areas (CD&T-S and CD&T-N). Inspection by the landfill operator ~~is has been~~ used to verify that only suitable waste is deposited in ~~this cell~~ these cells. All such waste ~~is has been~~ compacted to the highest degree possible and covered with soil materials on a monthly basis, to minimize the harborage of disease and scavenging vectors.

In response to concerns of the Louisiana Department of Environmental Quality concerning the lack of a cell liner and the possible existence of putrescible waste in CD&T-S ~~this area~~, Mundy Landfill ceased disposal operations in the CD&T cell in 1997, and installed a final cap. Upon completion of the cap, disposal operations for construction debris, yard waste, and trash were resumed in 1998.

Drawings **DSW-GP-05A** and **DSW-GP-05B** show the three borrow areas. Areas B1 and B2 are on the landfill property, and were used as sources for cover and construction materials for the first several years of operations. Upon their exhaustion, borrow operations were moved to a 14-acre portion of the Police Jury's 160-acre parcel of land which is adjacent to the western property line of the landfill. The perimeter barrier of the landfill was relocated to enclose the new borrow area, so as to maintain the limited access to the landfill, while facilitating borrow operations. Area B1 was included within the limits of Cell VI.

§521.F.2. The following information on plans and specifications is required for Type I and II facilities:

§521.F.2.a. Detailed plan-view drawing(s) showing original contours, proposed elevations of the base of units prior to installation of the liner system, and boring locations;

Original contours for the facility are presented on drawing **DSW-GP-03**. A plan view of the estimated excavation performed to prepare Cells I-V for liner installation is provided in drawing **DSW-GP-25**. This estimate was prepared using all available information concerning cell construction from historical files provided by the DeSoto Parish Police Jury and the Louisiana Department of Environmental Quality. The topographic cross-sections from the original 1984 permit application (drawings **DSW-GP-11** through **DSW-GP-19B**) provided the majority of the information. Drawing **DSW-GP-25** is not intended to indicate total site cell construction prior to beginning waste disposal operations. Cells were constructed and placed into operation individually as they were needed. The **DSW** series of drawing are presented in **Appendix N**.

Sheet 19 and **Sheet 20** in **Appendix O** show the excavation performed for Cell VI. **Sheet 8** in **Appendix P** illustrates the subgrade (excavation) contours for Cell VII, Phase 1. Drawing **STE-T1** in **Appendix T** shows the cell floor contours of CD&T-N

Sheet STE-4 in **Appendix Q** shows soil boring and piezometer locations for all geotechnical work performed at Mundy Landfill during its life, from the 1984 permit application through the 2002 subsurface investigation done to support this permit renewal application. Additional information concerning the 1996 borings is provided in **Appendix H**, and from the 2002 program in **Appendices M** and **R**.

§521.F.2.b. Detailed drawings of slopes, levees, and other pertinent features;

Detailed drawings concerning design and construction features of Cells I - V, as provided in the 1984 permit application by Southern Services and Russell Engineering, and in the facility historical files kept by the DeSoto Parish Police Jury and the Louisiana Department of Environmental Quality, can be found on the drawings in **Appendix N** of this document. The drawings in **Appendix O** depict the design and construction features for Cell VI and its associated site improvements. The design and construction features for Cell VII, Phase 1 are contained in **Appendix P** and the permit renewal drawings are presented in **Appendix Q**.

Some features of the landfill detailed on drawings include:

- the pre-liner cell excavation (drawing **DSW-GP-25, Appendix N**), (**Sheets 19 and 20, Appendix O**), (**Sheet 8, Appendix P**);
- the leachate collection system (drawings **DSW-GP-07 and DSW-GP-08, Appendix N**), (**Sheet 23 through Sheet 25, Appendix O**), (**Sheet 11, Sheet 20, Sheet 22 and Sheet 23, Appendix P**);
- the runoff/runoff system of diversion and containment berms (drawing **DSW-GP-26, Appendix N**);
- the landfill gas collection and removal system (drawings **DSW-GP-20A through DSW-GP-20D, Appendix N**);
- perimeter access road (drawing **DSW-GP-21, Appendix N**), (**Sheet 5 through Sheet 16, Appendix O**), (**Sheet 5 and Sheet 6, Appendix P**);
- installation details of monitoring wells MW-1 through MW-4 (drawings **DSW-GW-10 through DSW-GW-13, Appendix N**), monitoring well 4A and pre-2002 piezometers (1996 Subsurface Investigation Report in **Appendix H**), 2002 piezometers (**Appendix M**);
- landfill cross-sections taken through the disposal cells of the landfill which show areas of excavation and liner installation, areas of waste disposal, installation of the final cap, and slopes and embankments of the cells: (drawings **DSW-GP-11 through DSW-GP-19B, Appendix N**). (**Sheet 29 through Sheet 38, Appendix O**), (**Sheet 12 through Sheet 18, Appendix P**), and (**Sheets JEI-1 through JEI-14, Appendix Q**). The subsurface profiles on drawings **DSW-GP-11 through DSW-GP-19B** have been superseded by those on **Sheets JEI-3 through JEI-14 in Appendix Q**;
- final contours at closure of Cells I through V and Cell VII, Phase 1 are presented on **Sheet STE-5 in Appendix P**. Conceptual final contours for Cell VI and CD&T-N are presented on drawing STE-T2 in Appendix T ;
- the leachate treatment plant expansion (**Sheet 29 through Sheet 38, Appendix O**); and,
- the waste disposal control grid (**Sheet 40 and Sheet 41, Appendix O**) and (**Sheet 26, Appendix P**).

§521.F.4.a. Representative cross-sections and geologic cross-sections showing original and final grades, approximate dimensions of daily fill and cover, drainage, the water table, groundwater conditions, the location and type of liner, and other pertinent information;

Cross-sections through the site are provided in **Appendices N, O, P, and Q**. Drawings **DSW-GP-11** through **DSW-GP-19B** are cross-sections through Cells I-V and the **CD&T-S Area**. **Sheet 42** through **Sheet 51** in **Appendix O** are cross-sections through Cell VI and the treatment plant. Drawing **STE-T3** presented in **Appendix T** illustrates a cross-section through **CD&T-N**. These engineering drawings show the original ground surface, the subsurface profile and water table (as interpolated from all soil borings), the cell and oxidation pond excavation grades, the compacted clay liner installations for the cells and the oxidation pond, and the finished cap elevations for the six putrescible waste disposal cells and the non-putrescible disposal areas. These sections update similar cross-sections in the 1984 permit application to include modifications to the site utilization and the ceiling elevations for waste disposal that have been implemented since 1984. The geological cross-sections in **Appendix O** are part of the 1996 subsurface investigation report by Maxim Technologies, Inc., and include superimpositions of the soil boring logs on the cross-sections to aid in evaluation of the subterranean characteristics of the property. Design drawings for Cell VII are included in **Appendix P**. The stratifications shown on drawings **DSW-GP-12A** through **DSW-PG-19B** in **Appendix N** and **Sheet 42** through **Sheet 51** in **Appendix O** have been superseded by those of **Sheets JEI-3** through **JEI-14** in **Appendix Q**.

§521.F.6. The facility plans and specifications for Type I and II landfills and surface impoundments (surface impoundments with on-site closure and a potential to produce gases) must provide a gas collection and treatment or removal system.

Drawings DSW-GP-20A through DSW-GP-20D in **Appendix N** and **Sheet 27** and drawing STE-T2 in **Appendix T** ~~Sheet 28 in **Appendix O**~~ illustrate the landfill gas collection and removal system permitted at Mundy Landfill, in conformance with the requirements of the LDEQ. It is a passive system, meaning that there are no active forces, such as pumps, which aid in the removal of the methane from the closed cells. An Initial Design Capacity Report for this facility, a copy of which is included in **Appendix J** of this document, was submitted and accepted by the LDEQ in 1996. This report demonstrates that Mundy Landfill does not generate sufficient landfill gas to warrant the installation of active controls for the removal of the gas. The drawings presented in **Appendix P** show the closure cap for Waste Disposal Cell VII, Phase 1 and the landfill gas collection and removal system. The gas system is shown as an extension of, and connecting to, the existing gas system for Cells I - IV. The materials and installation details and specifications conform to the Solid Waste Rules and Regulations and are identical to those approved by the Department of Environmental Quality for Permit Modification No. 26, concerning the installation of Waste Disposal Cell VI.

As shown on the drawings, the system is to be installed when waste disposal operations reach the maximum permitted elevation in an area, and the cap is installed. After placement of the final cap, a trench is cut through the cap and into the top of the compacted wastes, and lined with crushed stone, which envelopes a perforated pipe. The piping system follows the contours of the final cap, to ensure migration of the landfill gas toward the atmospheric vents. Upon completion of the final cap installation, gas rising through the wastes will migrate upward along the bottom of the cap until it is intercepted by the piping. The gas will then follow the path of least resistance, which is the crushed stone and the perforated pipe in the trench, until the pipe reaches a riser vent. This vent penetrates the final cap and allows the gas to escape to the atmosphere. The riser vent is anchored in place with a reinforced concrete pad. The system includes cleanouts spaced according to the equipment used at Mundy Landfill.

The location of the landfill in a rural area with few residences in the immediate vicinity allows venting without causing an odor nuisance or a health hazard. Monitoring of the site by the landfill personnel, as described in **Appendix C**, ensures that the system is operating properly, that gas is not migrating through the ground beyond the limits of the disposal cells, and that gas concentrations are maintained below the required limits to prevent explosions or other safety hazards.

The surface impoundments (the three lagoons in the treatment plant) do not generate any detectable quantities of gas, and do not require a gas collection and removal system during their service life. Closure will include drainage of the three ponds, demolition of the two polishing ponds and excavation of the Oxidation Pond 1 liner, and backfill with fresh soil, as described in **§521.K.2.b**, negating the need for a gas collection/removal system.

§521.I.2. The implementation plans for Type I and II facilities must include a plan for closing and upgrading existing operating areas if the application is for expansion of a facility or construction of a replacement facility.

This document applies for renewal of the existing solid waste disposal permit for Mundy Landfill. The site has previously been upgraded by the construction of Phases 1 and 2 of Subtitle D Cell VI and the improved wastewater treatment plant in 1997, and continued with Phase 3 of the permitted Cell VI and Phase 1 of Cell VII.

The southern construction debris and trash area, CD&T-S, was closed and capped in 1997, with disposal operations re-commencing in 1998. CD&T-N is proposed for construction in 2007.

Non-Subtitle D Cells I - V were closed at the end of 1997 with the opening of Cell VI. Capping was performed in 1998 by Mundy Sanitary Landfill, LLC (MSL), the private operations company that leased the landfill from June, 1998 until July, 1999, but MSL failed to perform the required surveys to verify the thickness of the caps. Upon taking over the landfill in 1998, after MSL defaulted on their contract, the DeSoto Parish Police Jury (DPPJ) reached agreement with the LDEQ to perform shallow soil boring on a random spacing and frequency of at least two per acre to verify the caps. The DPPJ installed the landfill gas removal piping in Cells I - V. Trenching of the caps for installation of the piping provided thickness confirmation in those areas, allowing the borings to be used in other areas and maximizing the areas of the cap checked for proper cap thickness.

Design and permitting of Phase 4 of Cell VI and Phase 2 of Cell VII, consisting of the extension of the composite liner up the closed and capped side slopes of existing cells, may begin as Cell VII, Phase 1 nears capacity. LDEQ approval is expected to require no more than six months following submittal of permitting and design documents. The DPPJ is also considering expanding disposal operations by developing the 160-acre property immediately west of the existing landfill site as a new landfill. No schedule has been established for the new landfill.

§521.J.1.b. The method to be used and steps necessary for closing the facility;

Upon exhaustion of all available permitted disposal space, all cells and appurtenant facilities of the Mundy Landfill, not required for post-closure, shall be closed. **Appendix L** contains the Closure Plan for the facility. This plan details closure as permitted in this application. The plan will be reviewed six months prior to the date of intended closure to determine any changes that need to be made. Notification of intent will be forwarded to the administrative authority no later than 90 days prior to the date of final closure of the facility. This notification will cite the actual final closure date, any further changes or additions to the closure method, anticipated closure costs, or closure procedure described herein, and the anticipated schedule.

The DeSoto Parish Police Jury will update the parish mortgage and conveyance records concerning the site to indicate the locations of the disposal cells, and specify that these areas were used for solid waste disposal. The form to be used for this will conform to the example in Appendix F of the SWRR, will identify the name and address of the person(s) to contact concerning the contents of the site, and will be filed with the DeSoto Parish Clerk of Court. A sample is enclosed as the attachment to the Closure Plan, presented as **Appendix L**. A certified copy of the filed document will be submitted to the LDEQ.

The facility closure will be performed in such a manner as to minimize the need for further maintenance, and maximize the protection of human health and the environment. This procedure will include the required inspection and acceptance of the closed facility by the LDEQ inspectors and the recording in parish records of the necessary document describing the site as a closed sanitary landfill.

CELLS I - V:

Putrescible waste disposal cells are closed as they reach the maximum permitted elevation for disposal. Non-Subtitle D Cells I - V were closed at the end of 1997 with the opening of Cell VI. Closure caps for these cells are required to be at least 24 inches of compacted clay, according to the landfill permit. Capping was performed in early 1998 by Mundy Sanitary Landfill, LLC (MSL), the private operations company that leased the landfill from June, 1998 until July, 1999, but MSL failed to perform the required surveys to verify the thickness of the caps. Upon taking over the landfill in 1998 after MSL defaulted on their contract, the DeSoto Parish Police Jury (DPPJ) informed the LDEQ of the problem and reached agreement with the Department to perform shallow soil borings on a random spacing and frequency of at least two per acre to verify the cap thicknesses. The DPPJ completed installation of the landfill gas removal piping in Cells I - V, in November, 1999. Daily inspections for disease vectors has revealed no problem with these nuisances in Cells I - V.

CELL VI:

Cell VI, as currently designed and constructed, has reached permitted capacity. Non-putrescible waste cell CD&T-N is proposed to overlie a large portion of Cell VI as well as portions of Cells I, II, and III. The final cover over Cell VI will be installed over CD&T-N once the non-putrescible waste cell is filled. This will eliminate the probability of damaging the synthetic cover that is proposed for some slopes of Cell VI. Therefore, completion of final cover activities for Cell VI and

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CD&T-N will occur once CD&T-N has reached capacity. will close in early 2003. Closure of putrescible Waste Disposal Cell VI ~~will is to be performed according to §711.A~~ §711.E. The closure of Cell VI in accordance with the SWRR ~~will~~ minimizes the need for post-closure maintenance and prevent post-closure release of leachate to surface or ground waters. A closure plan is attached as **Appendix L**, for review and approval by the LDEQ. The permit owner will notify the LDEQ in writing a minimum of 90 days prior to initiating closure activities. This notification of intent to close shall include the intended date of closure, any required changes to the approved and permitted closure plan, and the schedule and estimated cost of closure activities. The procedure for cell closures will be as presented below.

Preclosure will include removal of any standing water; modification and maintenance of the runoff diversion and containment system until the final cap is completely installed; modification of the runoff diversion and containment system as required to protect adjoining areas; insect and rodent inspection and any necessary extermination measures; final compacting and grading of waste materials; installation of a landfill gas collection and removal system; and placement of the final daily and interim covers, as described in §521.F.6 above. Installation of the final caps will be as described in §521.J.2.a below. Completion of cell closure activities is followed by notification to the LDEQ concerning the closure, including submittal of all documents required by the LDEQ. Closure activities will be initiated within 30 days and completed within 90 days of the cessation of disposal operations. These deadlines may be extended by the LDEQ due to inclement weather or other unforeseeable circumstances.

The final cap will consist of a two-foot compacted clay layer installed over the entire area requiring closure. A 60-mil high density polyethylene (HDPE) geomembrane, similar to the component in the composite liner, will be installed over the clay cover on the slopes that are flatter than 4H:1V. Above this cap, an erosion layer will be placed. Installation of this composite cap will be monitored by the quality assurance/quality control (QA/QC) engineer for conformance to the QA/QC specifications, the current version of which is contained in **Appendix K**. Testing will be performed by the QA/QC Engineer to verify a completed construction which meets or exceeds the permeability requirements of the SWRR. Upon completion of closure activities, all as-built and testing information will be submitted to the LDEQ for review. Upon inspection and approval by the LDEQ, the final cover will be planted and/or seeded with an appropriate ground cover to minimize erosion.

Closure of the cell will begin with the installation of the landfill gas removal system. Cell VI is illustrated on drawing STE-T2 in Appendix T Sheet 27 and Sheet 28 in Appendix O and described in §521.F.6. Cell VII is illustrated on **Sheet 27 of Appendix P** and described in Section §521.F.6. The perforated piping, will be laid in trenches cut through the daily/intermediate cover and into the top of the disposed wastes. These trenches will be filled with hand-placed and compacted crushed stone, which will envelope the gas system piping. Vents will be installed to protrude through the final cap on intervals of no more than 100 feet.

The compacted clay cover will be installed upon completion of the daily/intermediate cover. Clay materials will be placed in lifts of no more than eight inches, and compacted above optimum moisture content to final thicknesses of six inches, or as required to meet the SWRR permeability

requirements. Compaction equipment and methods will result in a hydraulic conductivity of less than 1×10^{-7} cm/sec for the completed clay cap, as verified by testing performed by the QA/QC engineer. QA/QC procedures are given in Sections 02222, of the "Specifications," in **Appendix K**.

The HDPE geomembrane will be installed on top of the compacted clay cover on slopes flatter than 4H:1V. Installation crews provided by the material supplier and with at least five years experience in installation of HDPE liners and caps will be utilized. QA/QC requirements for the HDPE geomembrane are given in Section 07181 of the "Specifications," presented as **Appendix K**. ~~The geomembrane will be sealed around the landfill gas riser vents to prevent moisture infiltration at these points.~~ This will complete a cap installation which meets or exceeds the impermeability of the cell liner.

A minimum of ~~18~~ six inches of topsoil will be placed, graded, and prepared for seeding above the completed cap. Slopes of the final cover will not exceed four horizontal to one vertical (4H:1V) on the sides, as required by the slope stability computations in **Appendix J**, and will maintain at least four percent on the top to facilitate runoff. Upon final inspection and acceptance by the LDEQ, the topsoil will be seeded and watered to establish erosion control vegetation. The erosion control vegetation selected will be approved by the LDEQ prior to seeding.

CELL VII, PHASE 1:

Preclosure for this unit will be the same as described above for Cell VI. Closure will include installation of the landfill gas removal system illustrated on **Sheet 27 of Appendix P**. The final cover will be as described above for Cell VI. The geomembrane will be sealed around the landfill gas riser vents to prevent moisture infiltration at these points. ~~except that the 60-mil HDPE layer will not be used on the 1(V):3(H) side slopes. The topsoil layer for this unit will be six inches thick.~~ Slope stability calculations are included in **Appendix J**, and indicate adequate stability of the 1(V):3(H) side slope. Closure activities pertinent to Phase 1 of Cell VII are given in the Closure Plan, **Appendix L**.

WASTEWATER TREATMENT PLANT:

Landfill personnel will continue to operate the treatment plant to which the leachate from the closed cells will flow, and will monitor the closed cells in accordance with the post-closure requirements for the facility. Closure of the treatment plant will be performed at the end of the post-closure period, to allow continued treatment of leachate during this time. Closure will conform to the requirements of ~~§713.A~~ §713.E of the Solid Waste Rules and Regulations. If needed, an updated closure plan will be submitted to LDEQ for approval. Notification will be made to the LDEQ in writing at least 90 days of time of the intention to close the plant. Such notification will include the intended date of closure, any changes necessary to the approved landfill closure plan, and the anticipated closure schedule and estimated costs.

Closure will commence with the drawdown of the contents of the ponds, in a manner to conform to all requirements of the NPDES and state water discharge permits for effluent quality. As part of the drawdown and drainage of the plant, samples will be taken and testing performed to analyze the effluent. This analysis will follow the typical requirements of the Sampling and Analysis Plan of

the standard solid waste disposal permit for this landfill. Upon completion of drainage of the plant, the compacted clay oxidation pond liner will be de-silted and excavated, all materials being disposed in a properly licensed industrial waste facility. The concrete polishing ponds, the control structures and manholes, and the transfer piping will all be excavated and removed, to be disposed in a properly licensed industrial waste facility. Leachate transmission piping into the plant will be plugged with a minimum of two feet of concrete and a welded cap of compatible material and then abandoned in place, or removed in its entirety and disposed of in a properly licensed industrial waste facility. Clean fill will be brought in and used to fill the excavation pits for the ponds, with final grading to facilitate positive drainage to the nearest water courses and maintain the existing runoff patterns, and vegetation to establish erosion control.

Additional fencing, with a locked gate, will be installed around the treatment plant, with posted signage to deter unauthorized entry and warn of potential dangers. The plant outfall will have a locked valve to preclude tampering or unauthorized drainage of the pond, and the fencing will extend around the outfall to further hinder unauthorized access. This fencing will remain in place until the treatment plant is dismantled and removed at the end of the post-closure period.

SEDIMENTATION POND:

The surface water pond constructed for the containment and sedimentation of uncontaminated surface runoff will remain as a permanent unfenced impoundment, for use as wildlife habitat and maintenance water source.

SITE:

Existing buildings, roads, and facilities will remain in use as long as they are needed through the closure and post-closure periods. As individual features are no longer required, they will be removed or otherwise abandoned. Existing fencing will remain in place until notification that it is to be removed is submitted to and approved by the LDEQ. The gate at the site entrance will be kept locked, except during periods of inspection, maintenance, or other entry by authorized personnel during the post-closure period.

During the post-closure period, manholes and cleanouts on the leachate collection and transmission system will be modified to provide locking covers to prevent unauthorized access. After post-closure, leachate transmission piping will be plugged with a minimum of two feet of concrete and a welded cap of compatible material and then abandoned in place, or removed in its entirety and disposed of in an industrial waste landfill. The contaminated stormwater system from the Cells I - V to the treatment plant was abandoned in 1997 as part of the construction of the Waste Disposal Cell VI, including the plugging of the piping and the manholes with concrete. This piping will remain in place or be removed, depending on the disposition of the leachate transmission piping.

§521.J.1.c. The estimated cost of closure of the facility, based on the cost of hiring a third party to close the facility at the point in the facility's operating life when the extent and manner of its operation would make closure the most expensive.

Prior to Cells VII & CD&T-N, the costs for closure of the facility were calculated as \$1,221,000, based on third-party closure with all units still requiring closure. This estimate did not include:

- Cost for closing Cells VII, Phase 1 and CD&T-N
- Credit for work accomplished on Cells I-V, ASB #1, and Cell CD&T-S Cell.

The cost for closing Cell VII, Phase 1 is estimated as \$595,000. This is based on capping, etc., being required for the full cell. Work accomplished on existing cells totals at least \$466,000, but about \$70,000 of this is for areas which Cell VII, Phase 1 will overlie. The closure of Cell CD&T-N will add approximately \$20,000 to the total closure cost, since it overlies Cell VI (The Cell VI cost was included in the total cost of cells prior to Cell VII and CD&T-N).

The total closure costs at the date of this submittal are therefore estimated as \$ 1,440,000 ~~1,391,000~~.

Data sources and supporting calculations are given in **Appendix I**.

§521.J.2. The closure plan for Type I and II landfills and surface impoundments must include:**§521.J.2.a. A description of the final cover and the methods and procedures used to install the cover;**

Putrescible waste disposal cells are closed as they reach the maximum permitted elevation for disposal. The permitted procedure for cell closures is as follows. Preclosure activities to be performed include removal of any standing water; modification and maintenance of the runoff diversion and containment system until the final cap is completely installed; modification of the runoff diversion and containment system as required to protect adjoining areas; insect and rodent control inspection and any necessary extermination measures; final compacting and grading of waste materials; and placement of the final daily and interim covers, as described in §521.F above.

CELLS I - V:

Non-Subtitle D Cells I - V were closed at the end of 1997 with the opening of Cell VI. Closure caps for these cells are required to be at least 24 inches of compacted clay, according to the landfill permit. The use of compacted clay as the sole material for the final caps, instead of its use as part of a composite cap including a geomembrane, has been approved by the LDEQ for Cells I - V, since this design complies with the procedure previously approved in the 1984 permit application and modifications to the permit for those cells. The history of closure of Cells I through V was discussed in the Response to §521.J.1.b. Daily inspections for disease vectors has revealed no problem with these nuisances in Cells I - V.

A minimum of six inches of topsoil capable of supporting the intended ground cover is placed on the final cap. Final grading of cap and topsoil maintains a maximum grade of four horizontal to one vertical (4H:1V) on all side slopes to ensure stability, and a minimum grade of four percent on the top to facilitate drainage. Stability analyses for slopes described above have been performed for Mundy Landfill as part of previous height modification requests, and can be found in **Appendix J**. These reports show that, for the installation described and the waste heights involved, side slopes will have a factor of safety of over 1.50, indicating satisfactory stability. The topography of the closed cells is depicted on drawing **DSW-GP-04**.

An appropriate seedbed is prepared by disking the topsoil to a depth which precludes any damage to the top of the final cover. Soil amendments (fertilizer, lime, etc.) are applied based on analysis of the topsoil material being utilized and the ground cover to be planted. A perennial herbaceous cover is established by seeding with common Bermuda grass or other appropriate species, according to technical guidelines for erosion control published by the U.S.D.A. Soil Conservation Service, and as approved by the LDEQ.

Following stabilization of the site and the establishment of appropriate ground cover, the LDEQ and the Louisiana Office of Forestry will be consulted concerning suggestions for the planting of species of vegetation appropriate for the soils, climate, and final intended use of the reclaimed site. The species selected will not have growth characteristics (i.e., tap roots, etc.) which could compromise

the compacted clay final cover.

This installation will result in a maximum of surface runoff and a minimum of infiltration into the closed cell through the final cap, as demonstrated in the Hydrologic Evaluation of Landfill Performance (HELP) computer models performed by consultants for Mundy Landfill. Copies of the model results are included in **Appendix J**, and include a 1990 model for Cells I - IV and a 1996 model for Cells I - V. These models demonstrate that the final caps for Cells I - V will minimize infiltration into the closed cells, and the resulting leachate generation, to quantities that can be detained and adequately treated by the treatment plant prior to discharge from the site.

CELL VI:

The closure procedure for Cell VI is identical to that for Cells I - V, except that the final cap will be a composite consisting of at least two feet of compacted clay soils and a 60-mil high density polyethylene (HDPE) geomembrane over slopes flatter than 4H:1V. Preclosure activities will be as described above, and will begin once the fourth phase of Cell VI, CD&T-N, is at capacity. be followed by installation of the compacted clay. Upon completion of preclosure, a topographic survey will be made as the first step in the clay thickness verification procedure. The clay will be installed according to a quality assurance/quality control similar to that utilized in the construction of the cell liner. Specifications will be prepared after testing on the clay materials to determine the required methods for optimizing compaction and impermeability of the clay. Testing will continue during construction to confirm installation in accordance with the specifications, the permit, and the SWRR. Clay will be placed in loose lifts of eight inches and compacted at a suitable moisture content wet of optimum to a final thickness of six inches and a hydraulic conductivity less than 1×10^{-7} cm/sec. Final steps in the clay cap placement will include rolling and smoothing of the surface to allow installation of the HDPE top liner without damage over slopes flatter than 4H:1V. Upon completion of clay installation, a second survey will be performed and compared with the initial survey to verify clay thickness. Any areas of deficiency will be corrected prior to proceeding with the installation of the 60-mil HDPE liner or topsoil.

HDPE installation will include quality assurance/quality control procedures and testing similar to those used for the HDPE cell liner installation (see §521.F.4.b.). Such procedures will be specified in the closure plan for the cell for installation of the HDPE by a third party contractor with substantial experience in the construction of HDPE cell caps. The vegetative topsoil cover will be a minimum of six ~~18~~ inches, to preclude damage to the HDPE during preparation of the cover for seeding and future damage due to the root systems of the plantings themselves.

The cover design for Cell VI was approved by the Department in Modification No. 31. HELP model evaluation of this cover design. The composite cap will almost totally preclude infiltration of surface runoff into the closed cell, as illustrated by the HELP performed in 1996 concerning the cell, a copy of which is included in Appendix J demonstrates a low infiltration and therefore minimal leachate production.

CELL VII - PHASE 1:

The closure procedure for Cell VII, Phase 1 is identical to that described above for Cell VI, ~~except:~~

- ~~Due to the relatively steep [1(V):3(H)] side slopes, the HDPE layer will not be used there. It will be used on the flatter slopes at the top of this cell.~~
- ~~The vegetative topsoil cover will be six inches thick.~~

HELP modeling was performed specifically for Cell VII, Phase 1 in 2002. The results are presented in **Appendix J**, and show long-term leachate production rates of 11 gallons per day or less for Cell VII, Phase 1, and two gallons per day or less from the underlying portions of the closed cells.

TREATMENT PLANT:

The treatment plant will be closed at the end of the post-closure period, which will allow the treatment of leachate generated by the closed disposal cells during the post-closure period. Closure of the plant will be performed in a manner conforming to the requirements of the state and federal water discharge permits issued to the landfill, and as described in §521.K.2.b. below. Closure will not require the installation of a final cap, since the ponds will be removed in their entirety. The program includes verification sampling and testing of the subgrade soils to ensure that no contamination exceeding LDEQ RECAP standards remains. All materials will be deposited in an industrial waste landfill.

§521.J.2.b. An estimate of the largest area of the facility ever requiring a final cover at any time during the active life;

Sheet 34 of Appendix P is a plan of the site, showing the footprint around all currently permitted disposal cells, the proposed Cell VII, Phase 1, and the proposed final cap topography. Drawing STE-T2 in Appendix T illustrates the final contours over the fourth phase of Cell VI, CD&T-N. The topography for the currently permitted cells was approved in Permit Modifications 25 and 26. The total site area is approximately 62 acres. Approximately nine acres, within the 200-foot buffer along the east property line, is allowed by waiver to have ancillary facilities, but is forbidden to disposal operations. The largest area requiring final cover was 30 acres, before Cells I-V were closed. The area of the currently permitted cells indicated by this plan to still require final cover for disposal locations is approximately 15 +3 acres, itemized as follows:

Waste Disposal Cell I	4.08 acres	a
Waste Disposal Cell II	3.23 acres	a
Waste Disposal Cell III	3.62 acres	a
Waste Disposal Cell IV	3.62 acres	a
Waste Disposal Cell V	2.89 acres	a
Waste Disposal Cell VI	<u>3.90 acres</u>	
	<u>7.10 acres</u>	
Waste Disposal Cell VII/Phase 1	8.00 acres	
CD&T-S	3.80 acres	b
Construction Debris & Trash Area		
Asbestos Disposal Area 1	1.47 acres	a
Asbestos Disposal Area 2	1.78 acres	
<u>CD&T-N</u>	<u>6.80 acres</u>	

a: Already closed. See discussion at 521.I.2.

b: 2.2 Acres already closed

A ~~proposed new non-putrescible~~ waste disposal area, Cell ~~CD&T-N VII, Phase 1~~, lies ~~in the valley between Cell VI and Cells I-III along the western property line, north of Cell V and west of Cells II-IV~~. This area will be approximately seven eight acres in size, bringing the total area which will require final cover to approximately 22 +1 acres.

The standard operating procedure at Mundy Landfill has been to install the final cap over the disposed waste as the ceiling elevation for disposal is reached. The final cap is installed on the side slopes as the disposal of wastes as operations proceed upward, in order to ensure stabilization of the waste materials. Permit Modification No. 25 raised the ceiling elevation to 300 feet Mean Sea Level for the landfill. In Cells I - V, that elevation has been reached and the final five acres of the cap at the top of the side slopes were installed in early 1998, after cessation of disposal operations in these cells on December 31, 1997.

~~This procedure will be revised for Cell VI, due to its composite cap, which requires installation at one time. The compacted clay cap will be placed on the side slopes, as described above. The clay~~

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~~cover and the HDPE layer will be installed upon completion of waste disposal.~~

A final cap was installed over the southern Construction Debris and Trash area (CD&T-S) in 1997, in compliance with a request by the Louisiana Department of Environmental Quality, due to the lack of a cell liner in this area and concerns about the potential presence of putrescible waste within this area. The cover consists of 24 inches of compacted clay, as described above. This cell was reopened in 1998.

Cover within the asbestos areas is placed as the waste material is dumped and in accordance to the permit modification allowing asbestos disposal at Mundy Landfill.

§521.J.2.c. An estimate of the maximum inventory of solid waste ever on-site over the active life of the facility;

An Initial Design Capacity Report was researched, written, and submitted to the Office of Air Quality in 1996 for the purpose of determining the applicability of the new landfill gas control guidelines and the need to install an active gas removal system. This report included an estimation of the maximum inventory of solid waste expected to be disposed at Mundy Landfill. The inventory computation included all wastes disposed at the landfill through July, 1995; an estimation of the additional waste to be disposed of in the five non-Subtitle D putrescible waste disposal cells through an assumed final closure date of December, 1996; and an estimate of the total quantity of solid waste expected to be deposited in the Cell VI.

The quantity of wastes disposed through July, 1995 was summed from the solid waste disposer reports submitted annually to the LDEQ, totaling 274,798 wet-weight tons. From this value, an average annual rate of disposal of 28,926 tons per year was calculated by dividing the total by the nine and a half years of operations. This annual rate was used to estimate continued disposal in the five existing cells for the one and a half years from July, 1995 through the originally anticipated December 31, 1996 closure date, for a total of 43,389 tons. The total for Cell VI was computed using the Average End Area Method on cross-sections drawn for the design drawings for that construction (see **Appendix P**), and came to 166,453 tons. Summing these figures reaches the final design capacity of 484,640 tons for the 1996 configuration.

For the purpose of this application, a revision must be made to the original report. The disposal in the five existing disposal cells was extended to the revised closure date of December 31, 1997. Delays in the design, permitting, and construction of Cell VI necessitated the extension of the service life for Cells I through V to that date, which complied with the mandatory closure date for those cells. A conservative assumption of service life until the end of the year was used, and changes the total disposal from July, 1995 until closure of all five cells in December, 1997 from 43,389 tons to 72,315 tons. These changes to the original Initial Design Capacity Report result in an estimate for the maximum inventory of solid waste for Cells I through V of 347,113 wet-weight tons of putrescible refuse. To this sum must be added estimates for the non-putrescible waste and the asbestos disposed of at Mundy Landfill. The figure for the southern non-putrescible waste disposal area, CD&T-S, is taken from the 1984 permit application by Russell Engineering of Logansport, Louisiana and Southern Services of Shreveport, Louisiana. This estimate is 17,813 tons. The northern non-putrescible waste disposal area, CD&T-N has an estimated capacity of 246,475 tons. A very conservative estimate of 5,000 tons of asbestos is also assumed. Summing these quantities yields a total solid waste inventory at Mundy Landfill for this application of ~~537,000~~ 782,854 tons. The additional expansion of disposal area, (Phase 1 of Cell VII,) increased this number. The revised total is ~~755,000~~ 1,021,000 tons.

A copy of the original Initial Design Capacity Report is included in **Appendix J**, along with the acceptance letter from the LDEQ concerning the original report submittal.

§521.J.2.d. A schedule for completing all activities necessary for closure.

The final schedule for all closure activities will be submitted with the closure notification discussed in §521.J.1.a.

Putrescible waste disposal cells. Cells I - V were closed in December, 1997. Cell VI is currently active with the disposal of construction debris and trash waste. a service life of approximately five years to an anticipated closure date of 2003. Cell VII, Phase 1, is currently active and exists along the area north of Cell V and west of Cells II - IV. This eight-acre area is expected to have a service life of seven to eight years, extending the landfill closure date to 2010.

For Cells VI and VII, Phase 1, the 90 days for closure will include two weeks of pre-closure activities, followed by one month of compacted clay cap installation and quality assurance/quality control. The HDPE liner will be installed next, requiring two to four weeks. The final month will be used for placement of the vegetative cover and preparation and submittal of the construction certification document.

The southern non-putrescible waste disposal area, CD&T-S, was closed at the end of 1997, capped with 24 inches of compacted clay, and re-opened in 1998. CD&T-N will take over disposal activities of non-putrescible wastes once CD&T-S has reached capacity and will remain active until it reaches capacity or until closure of the facility. The two asbestos disposal areas will remain in use until closure of the landfill or until the available disposal area is exhausted.

The leachate collection and treatment system will be maintained in use through the 30-year post-closure period and will be closed and dismantled at its end. That date is estimated at this point as the year 2040. The 90 days for closure will include two months of demolition and disposal of all materials, including the treatment plant, piping, and manholes, and one month for preparation and submittal of the closure document.

§521.J.3. The closure plan for all Type I and II facilities and Type III woodwaste and construction/ demolition debris facilities shall include the following:

§521.J.3.a. The sequence of final closure of each unit of the facility, as applicable;

The date of final closure for each individual disposal cell will be 90 days from the date that waste disposal operations reach the current ceiling elevation of 300 feet, Mean Sea Level (MSL). Cells I - V were closed December 31, 1997 upon the opening of Cell VI. The fourth phase of Cell VI (CD&T-N) is currently active with the disposal of non-putrescible waste. a service life of approximately five years to an approximate closure date in 2003. Cell VII, Phase 1 is located along the western property line, which will keep the landfill in operation for seven to eight additional years. A new landfill may be planned for the 160-acre parcel immediately west of the existing landfill, and it would be designed, permitted, and constructed during the service life of Cell VII, Phase 1.

The southern non-putrescible waste disposal area, CD&T-S, was closed at the end of 1997, and re-opened in 1998 after installation of a cap/liner. CD&T-N which is the final phase of Cell VI will remain active until it is filled to capacity or until the facility is closed. The two asbestos disposal areas will remain in use until closure of the landfill or until the available disposal area is exhausted.

Landfill closure will be performed upon closure of Cell VII, Phase 1, unless design, permitting, and construction of further modifications in the existing permitted area or of the new landfill is performed. These could be as an extension of the existing landfill and a modification of the solid waste disposal permit. Landfill closure, when it is performed, will be accompanied by installation of additional fencing around the treatment plant and abandonment of the office and scales.

§521.J.3.b. A drawing showing final contours of the facility;

Sheet 34 in Appendix P shows the final contours for all areas of the landfill that are currently permitted ~~plus the proposed Cell VII, Phase 1.~~ Drawing STE-T2 in Appendix T illustrates the final contours over the fourth phase of Cell VI, CD&T-N. The ceiling elevation for putrescible waste disposal is 300 feet MSL, as approved in Modification No. 25 and No. 26. Modification No. 25 was a height modification for Cells I - V to raise the ceiling elevation for these cells from 275 feet MSL to 300 feet MSL. Modification No. 26 provided for a ceiling elevation for Cell VI of 300 feet MSL.

Sheet 27 in Appendix P and drawing STE-T2 in Appendix T illustrates other features of final closure, such as, erosion control, and a gas management system.

§521.L.4. Evidence of a financial assurance mechanism for closure and/or post-closure care and corrective action for known releases when needed.

The DeSoto Parish Police Jury (DPPJ) historically used the financial test in §727.A.2.i. LDEQ has indicated that the DPPJ should use the Local Government Financial Test in §727.A.2.j. Specific requirements under that standard are addressed below, based on the Independent Auditor's Report for the year ending December 31, 2002, submitted to the DPPJ by Little and Associates on July 28, 2003.

- Bond Rating: Standard & Poor's BBB+ (See "Official Statement" in **Appendix I**)
- Cash & Securities/Total Expenditure Ratio: (See "Independent Auditor's Report" in **Appendix I**)

Cash & Securities:	\$ 7,998,360
Total Expenditures:	\$19,629,832
Ratio:	$\$ 7,998,360 / \$19,629,832 = 0.41 > 0.05$
- Debt Service/Total Expenditure Ratio: (See "Independent Auditor's Report" in **Appendix I**)

Debt Service:	\$ 709,855
Total Expenditures:	\$ 19,629,832
Ratio:	$\$ 709,855 / \$19,629,832 = 0.04 < 0.20$
- DPPJ is not in default of any outstanding general obligation bonds, and no such bonds are rated lower than S&P BBB.
- The DPPJ did not operated at a deficit of 5% or more of total annual revenue for the year 2000 and just over 5% in 2001.

Y/E	12/31/01
Deficit:	\$ 1,372,817
Revenue:	\$14,811,109
Ratio:	$\$ 1,372,817 / \$14,811,109 = 0.09 > 0.05$

Y/E	12/31/00
Deficit:	\$ (528,549) - Surplus
Revenue:	\$ 14,534,293
Ratio:	$\$ (528,549) / \$14,534,293 = 0.04$ (Surplus)

The DPPJ also had a surplus in 1999.
- The auditor's opinions have not been qualified. Rather, the opinion of July 28, 2003, states the audit *"...is fairly presented in all material aspects..."*
- The closure/post closure care cost estimate is less than 43% of the DPPJ's total annual revenue.

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2002 Total Revenue: \$15,801,390
43% of above: \$ 6,794,598
Closure/Post Closure Cost Estimate
\$2,230,280 <43% Revenue
~~High: \$2,870,600~~
~~Low: \$2,099,600~~ <43% Revenue

- The DPPJ assures no other environmental obligations such that the total obligations exceed 43% of annual revenue.

A reference to the closure and post-closure care costs will be included in the DPPJ's future CAFR's, including all disclosures requested under §727.A.2.j.ii. The various items required under 727.A.2.j.iii will be placed into the operating records of the Mundy Landfill and updated according to that Section.

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ATTACHMENT B-3

Environmental Assessment Statement (EAS)

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ENVIRONMENTAL ASSESSMENT STATEMENT

INTRODUCTION

An Environmental Assessment Statement (EAS) addressing the "5 IT Questions" promulgated by the Louisiana Supreme Court is required by regulation under LAC 33:VII.523. In addition, this requirement was amplified and codified into law as LRS 30:2018.B.

This EAS has been prepared to respond to the above requirements for the Mundy Landfill.

Facility Background: The Mundy Landfill, Facility No. D-031-1827, has been in operation since 1986 under Standard Solid Waste Disposal Permit P-0035, issued by the Louisiana Department of Environmental Quality (LDEQ) on April 30, 1985. Permitted as a Type II (commercial and residential solid waste)/Type III (construction debris and trash) landfill, the facility was constructed in 1985 and received its first waste disposal in early 1986. In 2004, the facility received approval to become a Type I (industrial solid waste) landfill in addition to its Type II/III status.

From a small parish landfill, the facility has grown to a point where it approaches status as a regional landfill for northwestern Louisiana. Sources of wastes currently being deposited at the Mundy Landfill include DeSoto Parish and Red River Parish, the City of Mansfield, various individual generators in the East Texas counties of Shelby, Center, and Panola, and Waste Management, Inc. Several other agencies have inquired about disposing of wastes at this facility. The DeSoto Parish Police Jury (DPPJ), owners of the site and the permit, have an unlimited service area from which to solicit haulers and depositors of wastes.

Purpose: The DPPJ had three reasons for implementing plans for a solid waste disposal facility. First and foremost was the safe and efficient disposal of waste materials generated by parish residents. Prior to 1984, there were numerous open dumps in DeSoto Parish, and many more areas where solid waste was simply dumped by the side of the road. This resulted in unsightly and unsanitary conditions which threatened the environment and the health, safety, and quality of life of residents. The permitting and construction of a sanitary landfill, the organization of the DPPJ's Solid Waste Committee (SWC), and the enactment of an ordinance preventing littering all had the purpose of meeting these needs and eliminating these problems.

Federal and state environmental agencies were at that time laying the foundations for regulations requiring proper solid waste disposal. The DPPJ realized that the open dumps would have to be closed in the near future and governmental bodies like itself would be held responsible for the containment, regulation, and monitoring of solid waste disposal in areas under their jurisdiction. Construction of a landfill would not only provide for the needs of DeSoto Parish, but the lack of such facilities in the region raised the possibility of a revenue-generating business for the parish. Red River Parish and the City of Natchitoches were original partners with the DPPJ in the venture, and Red River Parish continues to deposit its solid waste at the Mundy Landfill.

The SWC and the landfill filled two additional crucial needs for DeSoto Parish. A rural area with high unemployment and a population of low- to middle-income residents, the parish needed employment opportunities for its citizens. Many people work for the landfill who otherwise would probably be unemployed. The operation of a landfill also generates revenues that pay for parish solid waste disposal that would otherwise have to be funded by tax increases.

Site Selection: The DPPJ made a concerted effort during the planning and original permitting of the landfill

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in 1984 to locate and utilize the most environmentally acceptable site available. Since the landfill was to be Parish-owned, site location within DeSoto Parish was a significant factor. During the search of the entire parish, five properties were inspected and considered. The site selected was further evaluated by qualified professional engineers and environmental specialists, state and federal environmental protection authorities, and appropriate regulatory agencies.

Site 1. The first site to be considered was an existing open dump at the DeSoto Parish Air Industrial Park. The dump would have been closed, and a new disposal cell meeting the criteria of the LDEQ Solid Waste Rules and Regulations (SWRR) would have been constructed. Site 1 was eliminated from consideration because of its proximity to the air park and the inevitable aviation safety problems caused by birds attracted to the landfill and flocking in an area of aviation traffic.

Site 2. A second site approximately two miles southwest of the air park was then investigated. This 80-acre tract was owned by International Paper Company (IP). Consideration was discontinued when the property was found to be still too close to the air park (see above), it encroached into a flood prone area, and IP was not interested in selling the site for use as a sanitary landfill.

Site 3. After a lengthy search for additional available properties, a third site three miles northeast of Grand Cane, LA was considered. Geological investigation revealed that the subsurface clays, sandy clays, and silty clays were not suitable as an in situ barrier; however, groundwater was relatively deep and an impermeable cell and surface impoundment liners could be constructed. This site was eliminated from consideration after further investigation. The 120-acre property had only 50 acres which could be used for disposal, and a waterway within the site eliminating access to a portion of the site and causing more of it to be within a flood prone area. The major problem was access, which would have required substantial improvements to a one and a half mile long parish road and replacement of a bridge, in order to hold up under the anticipated traffic load. There was also evidence that the road would have to be raised to protect it from overtopping during floods.

Site 4. A fourth property one and a half miles northwest of Holly, LA and 120 acres in size, was then investigated. Subsurface soils were again found to be unsuitable, and groundwater was found near the surface. Site 4 was dropped from further consideration.

Site 5. The fifth parcel considered, the current landfill site, was then found and researched. Environmental advantages of this tract included extensive depth of clay subsurface soils, a lack of freshwater aquifers, and no flood prone or wetlands areas. Other advantages included good access roads; its clear cut condition and availability for sale by IP; the availability of adjacent properties for sale for future landfill expansion; a remote location away from residential developments, schools and hospitals, and lignite exploitation areas; a central location to the proposed DeSoto-Red River parishes service area; and, its proximity near future Interstate 49. The site was not zoned or master planned, had no known historic, archaeological, recreational, or cultural sites, and was not conspicuously known for aesthetic beauty. Its remoteness would tend to minimize potential nuisance problems such as odors, noise, lights, and traffic, while its location on one major highway and near a future national highway (now I-49) would facilitate all-weather access.

Upon its preliminary acceptance, a geotechnical investigation was performed which determined that the clay soils were suitable for compacted clay liners which would conform to SWRR criteria. The LDEQ concurred that the site should be looked at further. The Department of Fisheries and Wildlife visited the site and concluded that no adverse environmental impact would result from construction and operation of a sanitary landfill. The U. S. Army Corps of Engineers researched the property and determined that there was

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no need for action on its part, since the site could be covered under existing nationwide permits. The firm of Heartfield, Price, and Greene conducted a historic-archaeologic evaluation, which led the Department of Culture, Recreation, and Tourism to issue a letter of "no objection" concerning the proposed landfill.

This research led the DPPJ to conduct detailed studies with the purpose of determining the engineering advantages and disadvantages of Site 5. It was discovered that the site has an abundance of native soil materials that are worthy as liner, cover, and final cap materials. There were no environmentally sensitive sites to be found in the vicinity, nor did the site encroach on wetlands or flood prone areas. The location of the landfill on a major highway, just one mile from a future interstate highway, only six miles from the largest city in the parish, and central to the proposed service area, made it very convenient for local residents and haulers from other areas. These features demonstrated that the site selected was the proper one.

Development of the site included features to minimize potential environmental and health risks (see below). Cell liners, leachate systems, and groundwater monitoring wells protect the groundwater. Surface runoff/runon measures, a wastewater treatment plant, and sedimentation ponds protect surrounding surface waters. Disposal cell closure caps and landfill gas monitoring procedures and equipment protect air quality.

Development: The facility currently has:

- five putrescible waste disposal cells (Cells I-V) constructed under the pre-Subtitle D regulations, all of which were closed at the end of 1997;
- two putrescible waste disposal cells (Cell VI and Cell VII, Phase 1) which were designed to meet the Subtitle D regulations (updated regulations from the U. S. Environmental Protection Agency) and updated Solid Waste Rules and Regulations SWRR). Cell VII, Phase 1 is currently active;
- two a construction debris and trash waste disposal areas; and,
- two asbestos disposal areas.

Supporting features include a perimeter fence with a gate at the entrance on U. S. Highway 84, an office building and scales at the gate, interior access road, wastewater treatment plant, two sedimentation ponds, storage shed, mechanics shop, and a groundwater monitoring well system.

The five non-Subtitle D disposal cells (Cells I-V) were closed to disposal operations at the end of 1997, due to their inability to conform to the more current state and federal regulations concerning composite cell liner construction. These five cells were constructed between 1985 and 1992 under regulations and in conformance with standard technology and practice concerning sanitary landfills current at that time, but which became obsolete in 1995. Final closure capping was completed in 2001; however, the closure cap certification document has been misplaced. These closures were performed according to the 1995 SWRR. These cells were replaced by a sixth disposal cell, Cell VI, half of which (Phases 1 and 2) was designed, constructed, and permitted under the current regulations and placed in service January 1, 1998. Phase 3 was constructed and placed in operation in 1999. CD&T-N, phase 4 of Cell VI, is a non-putrescible waste disposal cell overlying portions of Cells I, II, III and VI and was permitted in 2006. may be added at a later date. Cell VII, Phase 1, was designed in 2001 and underwent the permitting process in 2002-2003. Construction of Cell VII, Phase 1 began in 2002 under Construction Variance Requests approved by the LDEQ. Cell VII, Phase 2 may be permitted and constructed in the future and; ~~in conjunction with Cell VI, Phase 4,~~ would complete the development of the landfill on the currently permitted 62-acre property.

The non-putrescible waste disposal areas accepts only wastes which do not putrefy and contaminate storm runoff. These cells ~~are~~ is not lined and ~~have~~ no collection piping for interception of contact water

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and transmission to the wastewater treatment plant. Storm runoff is not considered wastewater and is allowed to discharge from the site without detention. Concerns expressed by LDEQ that putrescible wastes had been inadvertently deposited in CD&T-S this area resulted in its capping at the end of 1997 and re-opening in 1998.

The facility has two asbestos disposal areas that are not currently in use. Both are fenced and posted with warning signs to preclude access without the proper training and equipment. Cell VII, Phase 1 is currently used for asbestos disposal.

Treatment of site wastewater, including waste disposal cell leachate and contaminated storm runoff (water exposed to putrescible waste in active disposal areas), is performed by a facility consisting of three facultative lagoons operated in series. This plant is a 1997 expansion of the original single oxidation pond constructed in 1985, which consistently met water discharge permit effluent quality guidelines during the first 12 years of the landfill's operation, but which did not have sufficient detention capacity for contaminated storm runoff from the 25-year, 24-hour design storm. The construction and permitting of Waste Disposal Cell VI (Permit Modification Number 26) in 1997 included the re-construction of the oxidation pond and the installation of a pair of polishing ponds downstream from the oxidation pond. This expansion improves plant effluent quality and maintenance capabilities, while adding the required detention volume for the contaminated storm runoff and increased control of plant operations and maintenance.

Uncontaminated storm runoff (water which has not been exposed to putrescible wastes) is either diverted offsite or channeled to sedimentation ponds at the north central and northwest portions of the property. The majority of such runoff which passes through areas denuded of vegetation goes to the sedimentation ponds, where it is detained to allow eroded silt carried by the runoff to settle before the water is permitted to exit the site. This prevents eroded materials from settling into and filling waterways downstream from the landfill.

Another proposed major upgrade for the landfill involves the groundwater monitoring system. As described in the Permit Renewal Application, a subsurface investigation performed in 1996 has determined that the existing monitoring wells were not installed in the proper subterranean soil strata. Piezometers were installed in 1996 to determine groundwater depths and flow directions, such data to be used in the siting and installation of new wells which will properly monitor the water-bearing sand zones beneath the landfill. Data from the piezometers were recorded from April to October, 1997, combined with other data from the original monitoring wells, and submitted to LDEQ in support of proposed locations and depths for new monitoring wells. This information has been added to the Permit Renewal Application, and the applicant has revised the proposal to include information from a 2002 geological investigation. Upon approval from LDEQ, the upgrade to the groundwater monitoring system will be installed.

The service life of the five non-Subtitle D cells (Cells I-V) expired at the end of 1997, as required by the SWRR, with an anticipated total disposal capacity of 348,000 wet-weight tons of refuse. Cell VI, Phases 1 - 3, is expected to hold an additional 166,450 wet-weight tons of wastes. ~~Phase 4 of Cell VI could add another 1 - 2 years of service life and 50,000 tons capacity.~~ A service life of seven to eight years and a capacity of approximately 218,075 tons is anticipated for Cell VII, Phase 1. Phase 2 of Cell VII, if permitted, will add an estimated 100,000 tons more. If the facility is closed with the exhaustion of disposal space in Cell VI, Phase 3, and Cell VII, Phase 1, without further expansion of the horizontal and/or vertical disposal area of the disposal cells, approximately 755,000 wet-weight tons of putrescible waste is expected to have been disposed within its boundaries. An estimation of the design capacity of the Mundy Landfill, assuming values for quantities of wastes to be disposed up to the times of individual cell closures, is provided

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in **Appendix J** of the Permit Renewal Application. This estimation is a revision of the landfill gas generation report submitted to the Office of Air Quality (OAQ) in 1996, the revision extending the original expected closure date of Cells I-V from the end of 1996 to the end of 1997. The approval letter from the OAQ is also included in the Permit Renewal Application.

~~The applicant is considering a revision to Cell VI (Phase 4) to use CD&T-N, the fourth phase of Cell VI, is a non-putrescible waste disposal cell utilizing the otherwise wasted area between the first three phases of Cell VI and closed Cells I-III, by extending the Cell VI composite liner up the capped side slopes of the three closed cells. This will extend the service life for Cell VI, increase the estimated disposal capacity for the cell and the landfill by 246,475 close to 50,000 tons of non-putrescible waste, and require another modification of the landfill permit. Application for a modification to expand Cell VI in this way may be submitted at a later date.~~

Cell VII, Phase 1, was constructed along the west property line, north of closed Cell V and west of closed Cells II-IV. This eight-acre area has a standard composite liner construction for its western portion, and an approved alternate liner extending up the closed and capped side slopes of Cells II-IV. The construction consists of two phases, Phase 1 being built and permitted in 2001-2003, and Phase 2 being permitted and added at a later date. The Cell VII, Phase 1 location at the low point and borrow area of the 62-acre landfill property will result in an elevation difference of over 100 feet from the top of the cell liner to the permitted disposal ceiling of 300 feet Mean Sea Level. The depth and size of the cell will extend the service life of the landfill by seven to eight years and increase its capacity by approximately 40%.

The Mundy Landfill was operated by the DPPJ from 1986 to 1998. Early in 1998, after a solicitation for requests and extensive negotiations, landfill operation was privatized when an operations lease was executed between the DPPJ and Mundy Sanitary Landfill, L.L.C., a subsidiary of Andiamo Detroit, L.L.C. All property, equipment, and features of the landfill were included in the lease, while ownership of the site and the permit were retained by the DPPJ. The lease went into effect June 1, 1998 and had a life of 25 years. Mundy Sanitary Landfill, L.L.C. had the responsibility for all activities pertaining to operation of the site, including permit modifications, though the DPPJ had privileges concerning monitoring of those activities and approval of permit modifications. Mundy Sanitary Landfill, L.L.C. filed for bankruptcy one year after the lease went into effect, and the lease was terminated by the DPPJ due to failure of the private operators to fulfill the requirements of the contract. The landfill is now operated by the DPPJ once again.

Renewal of the landfill solid waste disposal permit began with promulgation by LDEQ in 1995 of the current edition of the SWRR, which requires the submittal of an application for a mandatory modification of the existing permit to demonstrate the updating of the features and operational procedures of the landfill to meet the new regulations. The application for the Mundy Landfill was initially submitted to LDEQ prior to the August, 1994 deadline, and resulted in a Notice of Deficiency (NOD) letter dated May 9, 1995. After a comprehensive geological investigation in 1996, re-submittal was made on April 28, 1997, and resulted in a second NOD dated October 22, 1998. Due to the privatization of the landfill and the subsequent problems (see above), several extensions of the re-submittal deadline were necessary and granted by LDEQ. The next submittal of the revised application was made October 3, 1999, and resulted in an October 5, 2001 NOD letter. Comments from that letter were addressed by July 12, 2002. Several rounds of NODs followed. ~~Copies of all NOD letters and submittal letters for NOD responses are provided in Appendix A of the Permit Renewal Application.~~

The existing landfill permit issued to the DPPJ in 1985 had a 12-year duration, expiring on June 30, 1997. The latest edition of the SWRR limits permits to a duration of ten years, and includes a provision that

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all existing permits issued for a period of over ten years were changed to a maximum of ten years or to an expiration of August 1, 1996, whichever was later. LDEQ established an expiration date of August, 1997 for the Mundy Landfill Permit P-0035, requiring the DPPJ to apply for a permit renewal. As recommended by LDEQ, the purpose of the original application was changed, from required mandatory modification of the permit to demonstrate compliance with the current SWRR, to renewal of the landfill permit. A letter requesting the changing of the purpose of this application and submitting the necessary review fee and proofs of publication of public notices is included in **Appendix A** of the Permit Renewal Application.

The purpose of the Permit Renewal Application is the renewal of the landfill standard solid waste disposal permit. It addresses all pertinent sections of the current edition of the SWRR, incorporates all comments from reviews of the application by LDEQ, updates the permit to demonstrate compliance with all current standards, and demonstrates conformance of the facility with the EPA Subtitle D regulations and the current edition of the SWRR. Features of the operation which cannot be modified to comply with the SWRR have been eliminated. Operational procedures are either updated to meet the new regulations or eliminated in the application. All features and procedures under which the facility is operated are addressed herein.

Conclusion: No one wants to live near a landfill, even a well-managed one. No matter how well the facility is operated, there are times when odors, litter, traffic, vectors, noise, and dust are problems for local residents. These and other nuisances have given landfills a bad reputation, which may result in the lowering of property values in the areas surrounding solid waste disposal facilities and the lack of development in such areas. The Mundy Landfill is sited in a remote, undeveloped area of DeSoto Parish. There is no current zoning or master plan for the area, and no development anticipated in the foreseeable future. There are few real adverse effects that have resulted from the operation of the Mundy Landfill, those being the occasional unavoidable problems which are inherent to solid waste disposal, and which are more nuisances than real problems. Significant adverse effects, such as air, water, and groundwater pollution, have been prevented by the planning, siting, design, construction, improvement, and operation of the facility. The landfill was built to improve the previous solid waste management system in DeSoto Parish, which had consisted of open dumps and littering. During its history, the Mundy Landfill has fulfilled this purpose.

The Mundy Landfill was, and continues to be, designed and operated to meet the latest standards and technology available. The DPPJ has modified the permit continually (twenty eight times between 1986 and 2000) to upgrade the landfill as necessary to comply with updates in the SWRR, improve its features and operations, and best serve its purpose of providing for the safe and economical disposal of commercial and residential wastes, construction debris and trash, industrial solid wastes, and asbestos for the residents and businesses of DeSoto Parish and surrounding areas. The renewal of its solid waste disposal permit will continue this history.

The following sections demonstrate that the Mundy Landfill meets the high environmental standards not only of LDEQ, but also those of the Louisiana Legislature and Supreme Court.

Discuss how the potential and real adverse environmental effects of the facility have been avoided to the maximum extent possible.

In general, there are many potentially harmful environmental effects from improper solid waste disposal. Waste disposal techniques and procedures developed for sanitary landfills, like the Mundy Landfill, prevent environmental damage from regulated disposal of solid wastes, as well as the much more serious effects that would occur if such facilities were not used. Sanitary landfills allow proper disposal, treatment, and monitoring of solid wastes and provide environmental barriers for the containment of

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pollution-causing materials. The concept of sanitary landfills, the establishment of the Department of Environmental Quality (LDEQ), and the writing, constant updating, and enforcement by LDEQ of the Solid Waste Rules and Regulations (SWRR) and landfill permits demonstrate the importance placed on the prevention of possible harmful consequences. The design, construction, and operation of the Mundy Landfill prevents such consequences in the following ways.

GROUNDWATER EFFECTS. Possibly the worst of the potential harmful effects of solid waste disposal is groundwater pollution, because of the difficulties in detecting and correcting this type of contamination, and the importance of uncontaminated groundwater for local water supplies. Groundwater contamination can result in the pollution of water wells and harmful effects to public health, and contamination of surface waters, endangering wildlife, agriculture, and recreational facilities. The importance placed on groundwater protection is evident in the emphasis of every requirement of the SWRR on preventive measures.

Groundwater may become contaminated in two ways. Disposed wastes have liquids in them, and rainfall can collect in disposal areas that include no measures to prevent it. Long term contact of liquids with decomposing solid wastes can result in the liquids becoming highly polluted. Such liquids are called leachate, and leachate seepage into the ground until reaching groundwater can cause groundwater pollution. Leachate can also flow overland until reaching waterways downstream from the disposed wastes. Such waterways may feed or be fed by groundwater, and pollution of the surface water can indirectly result in pollution of the groundwater.

The first step in preventing groundwater pollution is selection of a site which minimizes the chance of this happening. Some of the many advantages of the site selected for the Mundy Landfill include the thickness of the layers of native clay materials below the ground surface, the suitability of those materials for compacted clay liner and cap construction, and the depths of aquifers used for water supplies, all of which are crucial to the protection of groundwater. The Naborton formation is a subterranean formation of very dense clay up to 450 feet thick. The density of this material makes penetration of it by groundwater very slow and difficult. Groundwater travels much faster through sand and silt layers, and since liquids typically flow in the direction of least resistance, the clays below and above sand and silt layers usually confine groundwater flow to those layers. Aquifers in the vicinity of the landfill that are used for drinking water are at depths that allow construction of disposal cells and treatment ponds above the surface of the groundwater table, although there are some thin sand zones near the surface. The location of the regional aquifers deep beneath the landfill, with over one hundred feet of natural clay separating them from disposed waste materials, protects the groundwater from contamination.

The second step in preventing groundwater pollution is the use of environmental barriers to separate groundwater from disposed wastes. Construction requirements for sanitary landfills include low permeability liners and caps to contain wastes within disposal cells, while keeping groundwater out, and wastewater systems to collect and treat leachate and contaminated stormwater before releasing it to the environment. Disposal cell bottom liners include compacted clay materials that are a minimum of three feet thick, with densities and permeabilities that are superior to even the natural clay materials, resulting in several feet of very dense and impermeable clay between disposed waste materials and the environment. Recent construction at the Mundy Landfill (Cell VI and Cell VII, Phase 1) complies with improved construction techniques that include composite liners which have a plastic membrane installed on top of the clay liner, for added containment of leachate within the cell. The combination of recompacted clay liner and plastic liner is superior to either alone at preventing seepage of leachate out of the cell. The plastic is installed as panels that are overlapped and welded at their seams, which makes the seams as strong and impermeable as the panels themselves. When construction is complete, the plastic is essentially an impermeable "bowl"

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which contains the waste materials and keeps them from contaminating groundwater.

Atop the plastic membrane is placed a geotextile fabric which improves drainage across the liner and helps protect the liner from damage. On the bottom of the cell, above the fabric, a 12-inch thick layer of sand is placed as a filter and additional liner protection. The sand allows liquids to penetrate to the liner and collection piping, while any solids being carried by the liquids are trapped by the sand and kept within the cell. Since sand cannot be kept on the side slopes of the cell without it sliding down during rain, soil is placed in these locations over the liner to protect it from damage during construction and disposal operations. Leachate flows over the top of the soil liner cover and down to the bottom of the cell, where the sand filter blanket is located. These features protect groundwater by keeping waste solids within the cell and allowing liquid wastes (leachate) to be removed for treatment at the onsite wastewater plant.

Leakage into and out of waste areas is controlled by the construction of leachate collection and removal systems and nearly impermeable cell liners and caps. The native clay soils at the Mundy Landfill are capable of being compacted to achieve permeabilities that are significantly lower (better) than those required by the SWRR. The SWRR requires compaction of the clay liner materials to achieve a permeability rate of 1×10^{-7} cm/sec, or less. The materials and construction techniques at the Mundy Landfill result in liner permeabilities that reduce advective flow even more. Since liquids travel the path of least resistance, they will tend to flow across the top of the cell liner until intercepted by the collection piping, which will carry the liquids out of the cell and to the wastewater treatment plant. These features protect groundwater by keeping wastes contained within the disposal cell and separated from groundwater.

The bottoms of cell liners are sloped toward the collection piping, and the piping is placed in swales to increase the rate of interception. A system grid is installed that minimizes the distance leachate must flow before being picked up by the piping. This distance is 100 feet, in accordance with the SWRR. These design and construction features of the cell increase the interception of leachate by the piping and decrease the likelihood that leachate will seep through the liner, out of the cell, and into groundwater.

The eastern portion of Cell VII, Phase 1 is constructed on top of old disposal cells that were closed in 1997 (Cells II - IV). This is done to maximize the use of the property for waste disposal. Before the new cell liner was installed, the thickness of the closure cap over the wastes in the old cells was verified to exceed the thickness required by the landfill permit and the SWRR. On top of this compacted clay cap, a geocomposite is installed to promote gas migration, then more clay (at least 12 inches) is placed and compacted to achieve the same permeabilities mentioned above. On top of this clay liner, a geosynthetic clay liner (GCL) is placed. The GCL is a fabric which encloses a special type of clay called sodium bentonite. Sodium bentonite swells to many times its normal volume and density when it gets wet, and so is an excellent material for sealing leaks in compacted clay liners. The GCL is topped by a 60-mil HDPE plastic membrane, cushion fabric, and a protective soil layer. Any liquids that penetrate the soil, geotextile, and plastic membrane will hit the GCL, at which time the sodium bentonite will hydrate and become more impermeable, preventing the liquids from penetrating any further through the liner and possibly entering groundwater.

When the available space is exhausted in a cell, disposal is discontinued or relocated to another area, and the cell is closed. Closure includes materials and procedures that keep rainfall and surface runoff out of the cell and away from the disposed wastes. This separation prevents the water from becoming contaminated by contact with decomposing waste materials. The closure cap installed over the waste materials is composed of native clay compacted to a final thickness of at least two feet and to the permeability required for the cell liner. For Cells VI and VII, Phase 1, a plastic cover similar to the HDPE liner discussed above will be placed over the clay cap. ~~In Cell VI the HDPE cover will cover the entire cap~~

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~~and in Cell VII, Phase 1~~ The HDPE cover will be installed over the flat slopes on the peak of Cells VI and VII, Phase 1. This construction meets the requirements of the SWRR and is proven to exclude almost all of the exterior water from entering the closed disposal cell. This protects the groundwater by reducing the quantity of contaminated water and leachate generated by the disposal cell, and keeping the wastewater treatment plant from being surcharged to the point where its efficiency and effectiveness in treating the wastewater is reduced.

All of these features are constructed using procedures to guarantee that the materials used in the construction, the people and equipment employed to install them, and the procedures all combine to provide a final product which at least meets the requirements of the SWRR. These quality assurance and quality control (QA/QC) procedures include:

- the design of the disposal cell by professional engineers who are trained in this work and licensed by the state;
- the permitting of the proposed design and construction by the LDEQ;
- inspection of all environmental construction by qualified inspectors under the direction of a professional engineer with the requisite expertise;
- testing by a laboratory which is LDEQ-accredited;
- inspection by LDEQ inspectors; and,
- the approval of the project construction by the LDEQ after completion and before disposal operations are begun.

These QA/QC procedures protect groundwater by ensuring that the construction procedures and materials utilized in the project are in conformance with the environmental regulations created to protect the groundwater.

The third step in preventing groundwater pollution is monitoring. The Mundy Landfill is in the process of improving its groundwater monitoring system in accordance with the Groundwater Sampling and Analysis Plan (SAP), presented in **Appendix F** of the Permit Renewal Application. Implementation of the SAP is expected to begin in 2005. The original four monitoring wells were sited inadequately and do not provide sufficient information for proper monitoring. Additional monitoring wells have been and will be installed to correct this situation by ensuring that upgradient and downgradient wells exist for the three permeable zones identified beneath the landfill. Upgradient wells provide information about the natural constituents in the groundwater before it reaches the landfill. This information is compared to samples from the downgradient wells, with any discrepancies indicating possible leakage from the disposal cells. The wells are sampled on a semi-annual basis, after the establishment of background, and analyses conducted by a state-accredited environmental laboratory, with the results being submitted to LDEQ semi-annually. This system protects groundwater by allowing for the detection of any contaminants in the groundwater that may have leaked from waste disposal cells, and causing the immediate implementation of remediation procedures.

Other possible sources of groundwater pollution include the flooding of monitoring wells and the migration of landfill gases through the soil until they come in contact with groundwater. Protections for the groundwater from these sources of pollution include the installation of wells in non-flood areas and the construction and operation of a landfill gas collection and venting system. The first prevents flooding of the wells, and the second employs procedures and equipment that remove landfill gases from disposal cells by venting them to the atmosphere, and monitor the migration of landfill gases through the ground.

All of these features of the Mundy Landfill design and construction prevent groundwater pollution by containing leachate and solid waste materials within the disposal cell, preventing groundwater from

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infiltrating into the disposal cell, minimizing the entry of surface runoff and rainfall into the disposal cell, removing leachate from the disposal cells to the wastewater plant for treatment, monitoring the release of all liquids from the landfill property, monitoring the groundwater for any possible leakage of waste materials from the cell, and ensuring that the proper construction materials and techniques are used.

SURFACE WATER EFFECTS. Contamination of streams is another possible adverse effect of solid waste disposal. Surface waters may be polluted by the release of leachate or contaminated storm water from disposed wastes, by the direct addition of such wastes to the surface waters, or indirectly by pollution of groundwater which serves as a source for the surface water (discussed above). Such pollution could affect public health, wildlife, agriculture, and recreation. Contamination of surface water occurs when rainfall or surface runoff comes into brief contact with solid waste, then continues to flow downhill until entering a body of water. Contaminated surface water is not as high strength and cannot pollute groundwater as much as leachate, but can cause harmful results. Leachate and contaminated stormwater were uncontrolled and unregulated products of the open dump system utilized for decades in not only DeSoto Parish, but many other locations. The Mundy Landfill was planned, designed, constructed, permitted, and operated to replace and eliminate such dumps.

The liners, closure caps, and leachate collection and removal systems discussed above were designed and constructed to control, contain, and separate polluted waters generated by solid waste disposal. These features of the landfill protect surface waters by collecting harmful liquids and conveying them to the wastewater treatment plant for removal of the waste products and conversion of the contaminated water to relatively harmless water which can be safely released to the environment.

All surface runoff exiting the landfill does so at one of four "outfalls." Three are along the north property line and the fourth is at the southeast corner. A fifth outfall discharges from the wastewater treatment plant, thence to one of the outfalls exiting the site. All five outfalls are sampled and monitored according to the Louisiana Pollutant Discharge Elimination System water discharge permit issued to the landfill. This protects surface water by monitoring the waters exiting the site which will enter downstream waterways.

Sedimentation ponds collect runoff from newly constructed disposal cells and other areas denuded of vegetation, and hold such runoff for a period of time, until eroded soil materials carried by the runoff settle to the bottom of the ponds. The water is then allowed to exit the ponds and the site. Such treatment, while not pertaining directly to solid waste, prevents erosion of the site during construction and disposal operations from resulting in sediment buildup in downstream bodies of water, which could adversely affect wildlife and cause flooding.

Another protection for surface water is a system of controls for surface runoff and runoff. Surface water outside the limits of disposal cells is prevented from entering the cells (runon) by a series of earthen berms and drainage ditches which channel the surface flow around and away from the cell. The water is discharged into the sedimentation ponds for removal of the silt. This prevents the brief contact of the water with disposed wastes that would turn it into contaminated stormwater and require its treatment at the on-site wastewater treatment plant. Contaminated water due to rainfall inside the cell (runoff) is contained by earthen berms and directed to the collection piping for interception and conveyance to the treatment facility. This prevents contaminated water from exiting the site without treatment.

These features of the Mundy Landfill design and construction prevent surface water pollution by containing leachate and solid waste materials within the disposal cell, minimizing the entry of surface runoff

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and rainfall into the disposal cell, controlling contaminated water within the cell, removing leachate from the disposal cell to the wastewater plant for treatment, directing silt-laden stormwater runoff to the sedimentation ponds for desilting, and monitoring the release of all liquids from the landfill property.

AIR QUALITY EFFECTS. A third potentially harmful effect of solid waste disposal is pollution of the air. This could be caused by release of landfill gas generated by decomposing waste materials, either directly at the site of disposal or indirectly after migration of such gas through subsurface soils. Possible effects of air pollution include threat to human health, noxious odors, and explosions.

The Mundy Landfill includes features and procedures to control the migration and release of gas generated within the cell by waste decomposition. The site for the landfill was selected partly because it is relatively remote, with few residences and businesses close enough to be affected by gases. Disposal cell liners and caps are more impermeable than the wastes they contain, and trap and divert gas to collection systems which release the gas to the atmosphere at specified locations, where they can be tested and monitored. Air currents dissipate vented landfill gas before it becomes a nuisance to neighbors. Monitoring equipment is used by trained operators to ensure that gas concentrations within buildings and at the landfill boundaries, above and below ground, are less than levels stipulated in the SWRR, preventing explosions and migration outside the landfill limits. A landfill gas monitoring plan in **Appendix C** of the Permit Renewal Application details procedures and protocols to be employed by landfill personnel.

The siting of the Mundy Landfill, the passive landfill gas venting system designed and constructed for its waste disposal cells, and the landfill gas monitoring system prevent any harmful effects from air pollution. The June, 1998 Initial Design Capacity Report required by and submitted to the LDEQ, used criteria supplied by that office to demonstrate that the gas collection and venting system installed at the Mundy Landfill is satisfactory in controlling landfill gas. The size of the facility, the types of wastes permitted for disposal, and the relatively small volume disposed daily result in the generation of quantities of landfill gas which are not harmful and can be handled by the gas system, as approved by the LDEQ.

VISUAL EFFECTS. Without proper operation, solid waste disposal can quickly become unsightly, due to uncovered wastes, blown paper, waste hauling traffic, dust, exposure of wastes and operation to local traffic, etc. People living in the vicinity or using roadways passing landfills may be exposed to such eyesores. While it is not possible to totally eliminate such problems, the location, construction, and operation of the Mundy Landfill minimizes such adverse effects as much as possible. The landfill is located in a rural, unpopulated area. Disposal cells which are visible from U. S. Highway 84 along the landfill's southern property line were all closed at the end of 1997, and are now vegetated and utilized as visual barriers to screen current disposal operations from the road. Active disposal cells are at low areas of the property and surrounded on all sides except the north by closed disposal cells or higher ground, which screen the active areas from the highway. North of the property is undeveloped land, negating the need for screening in this direction. Additional screening is provided by the planting of vegetation along the southern property line.

Operational procedures of the landfill also prevent adverse visual effects and are part of the landfill permit. Disposed wastes must be covered at the end of each day with a spray-on material, or other approved daily cover, which covers the wastes and prevents windblown paper. Each week ends with the active disposal area that has not been covered with earthen cover, being covered with a minimum of six inches of soil, providing additional containment. Temporary closure of a disposal area must include an additional six inches of soil over the disposed wastes, and permanent closure requires construction of a cap consisting of a minimum of two feet of clay which must meet the materials and installation specifications of the compacted clay cell liner.

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Litter fences are used around active disposal areas to prevent the escape of litter. Landfill personnel inspect and police the landfill on a regular basis to pick up litter and identify and repair any areas of temporary or permanent closure caps from which unsightly materials might escape. Dust is controlled by moistening dust source areas during times of no rainfall.

These features, construction measures, and operational procedures prevent adverse visual effects at the Mundy Landfill.

NOISE REDUCTION. Similar to adverse visual effects, noise can offset the benefits that a landfill provides to a community. Waste hauling traffic, landfill operational equipment, birds, and other sources can generate a significant amount of noise which would affect local residents. Many of the features of the Mundy Landfill which prevent noise pollution are discussed in the previous section. Noise is reduced by screening active disposal cells with surrounding features which are higher and contain the noise, by the daily covering of disposed wastes to prevent birds from gathering, and by the siting of the landfill in a remote area. Also, the operational hours limit disposal operations to those times which would cause the least disturbance to local residents. These many factors keep noise from disturbing any local residents and the landfill from becoming a nuisance.

VECTORS. Landfills are recognized sources of food and shelter for disease-causing animals, such as birds, insects, and rodents. These wild animals are called vectors and can carry diseases which are harmful to people and other animals. Even healthy animals, wild or tame, can be harmful to local traffic, nuisances to nearby residents, and problems for agriculture. The SWRR require the control and elimination of vectors by such methods as daily, interim, and final covers for disposed wastes, use of approved pesticides, control of wastes within disposal cells, daily site inspections, and other procedures. The Mundy Landfill observes and practices all approved methods for controlling vectors with procedures which are detailed in the Permit Renewal Application. These procedures have historically prevented vectors from being a problem at this facility.

DEVELOPMENT. As described above, the Mundy Landfill is located in a rural, unpopulated area of DeSoto Parish. There are no master, zoning, or development plans for the area, existing or anticipated. The few neighbors that the landfill has have never objected to its presence and operation. This lack of development prevents the landfill from being a nuisance.

Public hearings were conducted when the landfill was being planned, and the public endorsed the plan. All permit modifications over the subsequent 17 years have required advertisement and public viewing periods, with no objections being voiced. The DPPJ and its Solid Waste Committee meet at least monthly in public forums, to which residents are allowed to express concerns or problems, and none have done so. The landfill is sufficiently distant from its neighbors and operated in such a way that there have been no complaints directed to the DPPJ.

REAL ADVERSE EFFECTS. There are few real adverse effects that have resulted from the operation of the Mundy Landfill, those being the occasional unavoidable problems which are inherent to solid waste disposal, and which are more nuisances than real problems. Significant adverse effects, such as air, water, and groundwater pollution, are unknown at this facility, having been prevented by its planning, siting, design, construction, permitting, and operation. The lesser nuisances like occasional traffic, dust, noise, and visual problems are heavily outweighed by the serious adverse effects which existed before the landfill was built. This facility was conceived to improve the previous solid waste management system in DeSoto Parish, which consisted of open dumps and littering. During its history, the landfill has fulfilled its purpose of providing

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the residents of the parish with an environmentally safe location and method for disposing of solid wastes.

CONCLUSION. The Permit Renewal Application demonstrates that the permitting, construction, and operation of the Mundy Landfill meets or exceeds all of the current regulations and technology for sanitary landfill construction. As described above, the many potential adverse effects of sanitary landfill operation are mitigated or eliminated by its design, and the multitude of much more serious consequences of open dump disposal and dumping of waste materials along the roads or in the forests, as practiced before the landfill was built, are prevented. The Mundy Landfill has a history and tradition of providing safe, economical, and efficient disposal of solid wastes for the citizens of DeSoto Parish. The continued use of this facility will provide improved protection to the public health and the environment of DeSoto Parish, Louisiana.

Demonstrate using a cost-benefit analysis that the social and economic benefits of the facility outweigh the environmental-impact costs.

Having determined the potential and real adverse impacts of the landfill, it is possible to compare the environmental, social, and economic costs of the facility with its environmental, social, and economic benefits. As part of this evaluation, one must also consider the costs and benefits of the likely alternatives to the sanitary landfill, which were considered prior to the adoption of the sanitary landfill concept and are described in the following section. Each alternative will be discussed below.

OPEN DUMPS. The system of solid waste management practiced in DeSoto Parish prior to the construction of the Mundy Landfill was recognized as being detrimental to the environment and to human health and safety. There were at least 14 open dumps in DeSoto Parish, which were characterized by the Northwest Coordinating and Development Council as failing to meet sanitation requirements and resulting in a total lack of any organization for solid waste disposal in the parish. Some of the problems rising from open dump operation included open fires, stray animals and other potential disease vectors, and littered roadways throughout the parish, along with a total lack of control over what materials were disposed. This obviously inadequate solid waste disposal system posed a serious threat to the environment and human health and was ordered to be closed by the LDEQ prior to July, 1985, which would have left the residents of DeSoto Parish with no disposal capabilities whatsoever without the Mundy Landfill.

COMMERCIAL DISPOSAL. Commercial disposal of the parish's solid waste would have been the most environmentally friendly solution to the parish's solid waste disposal dilemma. The ability to have a waste hauling company collect all waste materials, remove them from the parish, and properly dispose of them would eliminate all potential adverse impacts on the environment and much of the DeSoto Parish Police Jury's liability for them. This option would also compare favorably with any kind of local disposal facility when the problems typically associated with such a facility, such as odors, noise, dust, animals, etc., were considered. These factors would have been the reasons for popular support for this alternative.

The disadvantages outweighed the advantages, however. Although there would be no capital costs for construction of a facility and purchase of equipment, the proposals solicited by the DPPJ from several waste haulers indicated that the cost of commercial disposal would be prohibitive. There would be no separate revenue source from which to pay for this service, requiring either the raising of collection rates or allowing the disposer to set rates. Either would have resulted in higher rates, which would have been opposed by parish residents and could be expected to become a political issue. Allowing the disposer to set the rates would have required the DPPJ to police those rates to prevent them from becoming excessive.

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Interruption of waste collection would be possible, due to bad weather, contract termination, or employee strikes. Residents would not be able to dispose of waste that the commercial hauler would not collect, due to size or type, and would have to wait for the next scheduled collection day to get rid of waste that they would prefer having removed immediately, storing it on their properties until then. Any of these situations could have resulted in littering and open dumping, damaging the environment.

DPPJ attempts to encourage economic development by soliciting companies to relocate to the parish would have been damaged by this alternative. A lack of local disposal facilities would be considered by such businesses a disadvantage to siting in DeSoto Parish, due to necessary costs for waste disposal outside the parish. Use of a commercial disposer also would not have been likely to result in jobs for parish residents.

Comparison of the advantages and disadvantages of commercial disposal caused the DPPJ to discontinue consideration of this alternative.

INCINERATION. Incineration was another option considered by the DPPJ for replacement of the open dump system of solid waste disposal. Such a facility would eliminate to a large extent the dangers of groundwater and surface water pollution, but would intensify the possibility of pollution of the air and resultant human health problems. Location of the plant was expected to be a major political issue, due to anticipated odors, noise, and fears of exposure to air pollution.

Investigation into this method quickly revealed that incineration would not satisfy the disposal needs of the parish, and was prohibitively expensive. This cost factor would force the raising of collection rates, which would be an unfavorable issue, both economically and politically. Another economic matter would be the cost of maintaining the collection service, with no revenue source available to the DPPJ to pay for it. The potential for revenue generation from energy production was offset by the capital costs of the generation and distribution facilities necessary to take advantage of energy production. A third financial matter was the likelihood of having to continually modify the plant to maintain compliance with constantly changing regulations and stricter controls.

Another consideration was the complexity of the technology. The training of local people in operation of an incineration facility would be difficult and costly, and might involve bringing in experienced operators from other locations, instead of easing the parish unemployment situation by hiring locally. Incineration would also be inappropriate to some companies considering siting in DeSoto Parish, leaving such companies without demonstrated, available waste disposal capabilities, thus jeopardizing the economic development to be realized from new industries relocating to the parish.

Comparison of the advantages and disadvantages of incineration caused the DPPJ to discontinue consideration of this alternative.

RESOURCE RECOVERY AND RECYCLING. While incineration would not satisfy the solid waste disposal needs of the parish, these needs would not satisfy the capabilities of resource recovery and recycling (RRR). Such operations require a very large waste stream to be economically viable, and this would be unavailable in DeSoto Parish. The prohibitive cost of construction and operation would, as discussed above, require collection rate increases which would be opposed by parish residents as an unreasonable burden. The facility would not eliminate the need for disposal of the separated, unrecycleable materials, which would be another cost on the parish. Changing regulations and stricter controls would require frequent capital outlays for plant improvements. Finally, the volatility of the markets for recyclable materials resulted in the inability to estimate the revenue that could be generated by a RRR plant.

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A RRR plant would have many environmental disadvantages without offsetting advantages. Separation of the waste stream would leave a large quantity of solid waste that would still have to be disposed. Potentials for groundwater and surface water pollution from stored wastes awaiting processing would require the construction of lined storage cells, wastewater treatment facilities, surface water control features, etc. Odors and decomposition gases from stored wastes awaiting processing would not be controlled, causing nuisances and possible threats to the health of neighboring residents. These issues would result in problems in siting the facility and political opposition to this alternative. Control of birds, insects, and rodents would be a problem, which would upset neighbors and eventually become a political issue. Similar to incineration, some industries considering relocation to DeSoto Parish would be unable to utilize a RRR facility for their solid waste disposal needs, forcing them to go elsewhere.

Comparison of the advantages and disadvantages of resource recovery and recycling caused the DPPJ to discontinue consideration of this alternative, although there was agreement that such a facility could possibly be included in whatever solid waste disposal option was eventually adopted and implemented.

SANITARY LANDFILL FOR USE BY DESOTO PARISH ALONE. Evaluation of a sanitary landfill as a possible solid waste disposal solution for DeSoto Parish led to its eventual implementation. Research into landfills revealed that such facilities are relatively inexpensive to construct and operate, and involve non-complex but proven technology which would lend itself to the training of local residents as operators, easing the parish unemployment problem. Landfill technology was considered well suited to DeSoto Parish, due to the extent of subsurface soils with suitable characteristics for containment liners, and large, undeveloped, rural areas to be used. The facility could be owned and operated by the DPPJ, which would ease the concerns about interruption of collection and disposal services due to contract problems or strikes. Funding could be provided by bond issues, instead of raising collection fees.

A local landfill would be attractive to industries considering relocation to DeSoto Parish, allowing the DPPJ to market the landfill for economic development. It would provide a site for parish residents to conveniently dispose of waste items that the collection system cannot accommodate and other items that need to be disposed of immediately, instead of having to wait for the next scheduled collection day. Location of the facility in a remote, undeveloped part of the parish would minimize concerns of odors, noise, and other nuisances. These factors led to the expectation of little opposition to this kind of facility.

Research indicated that a properly sited, constructed, and operated landfill would not be a threat to the environment. The possibilities for water, groundwater, and air pollution would be present, but there were technologies available to minimize or totally eliminate those dangers. Most of these technologies had already been proven at other landfills or in other applications which could be adapted to landfill construction. Construction techniques for clay liners resulted in very low permeabilities, preventing groundwater and air pollution from leachate and landfill gas, respectively. Features could be included to control surface water runoff and runoff, preventing any contamination of the surrounding streams and bayous. Leachate treatment could be achieved by types of normal wastewater treatment. State and federal agencies were available for advice and direction.

Initially, a facility to be used only for parish residents was considered. Financial evaluations indicated that such a project was feasible, but that a regional landfill would generate enough revenue to be self-sufficient.

SANITARY LANDFILL WITH POTENTIAL REGIONAL USE. The regional landfill concept was finally adopted and implemented. The use of a service area including areas outside the parish extended the benefits

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of inexpensive solid waste disposal to other areas of the state, and even outside Louisiana. Red River Parish initially indicated its willingness to participate in the project on a tipping fee basis, but the Mundy Landfill now receives waste from several areas of the state and eastern Texas. This expansion of the concept has resulted in the discovery that the landfill can pay its operational costs and not use DPPJ revenue that is needed elsewhere.

The Mundy Landfill has been a source for much needed jobs to lower the unemployment rate in the parish. It has been used as a marketing tool, as a benefit to be considered by companies investigating the possibility of locating to DeSoto Parish. Parish residents have demonstrated acceptance of the facility and the convenience it provides by consistently voting bond issues for its development and improvement.

The landfill has also proven to be an economic boon to the parish. It provides free disposal for parish residents, and revenues generated by its tipping fees are used to keep taxes down in this rural parish dominated by low- to middle-income residents and unemployment.

CONCLUSION: A cost-benefit analysis demonstrates conclusively that a solid waste landfill with regional use is the optimum means of providing for the solid waste disposal needs of DeSoto Parish. Many alternatives were considered by the DPPJ, and their selection of a landfill has been a major improvement to the parish. The facility has been consistently upgraded to conform to updates in the Solid Waste Rules and Regulations, resulting in little adverse impact on the environment. The many features of construction and operation described in other sections of this Environmental Assessment Statement have prevented any significant adverse environmental or public health impacts. Construction of the landfill as a replacement of the previous open dump concept which was outlawed by the state has, in fact, dramatically improved the area's environmental condition by eliminating the problems with the open dump system. The Mundy Landfill provides a very satisfactory method of performing solid waste disposal while improving the protection of the air, water, and groundwater of the parish and ensuring no adverse health effects due to solid waste disposal

Discuss possible alternative projects which would offer more protection to the environment without unduly curtailing nonenvironmental benefits.

The DeSoto Parish Police Jury (DPPJ) conducted an extensive study of alternative methods of solid waste disposal for the parish. The following options were considered, evaluated, and reported in the 1985 original solid waste disposal permit application:

OPEN DUMPS. The system of solid waste disposal prior to 1985 was a series of at least 14 open dumps parish-wide, which were determined to be unsanitary and out of compliance with most environmental regulations. These facilities were beset by fires, lack of control, insects, birds, and rodents, and could not be utilized, even with substantial improvements, in a new solid waste disposal program. All open dumps had to be closed, by order of the LDEQ, prior to July, 1985.

COMMERCIAL DISPOSAL. Project planners conducted preliminary interviews and investigations with the relatively small number of commercial waste disposers operating within the state. None of these firms presented proposals which were financially acceptable to the DPPJ. Therefore, utilization of this alternative was determined to be unacceptable under the present market conditions.

INCINERATION. A brief review of the potential use of incineration as a solid waste disposal method was

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conducted by project planners. It was found that an incinerator would not satisfy the total disposal needs of the parish. Also, the costs of the systems available were prohibitive. Therefore, utilization of incineration was determined to be unacceptable under the present market conditions.

RESOURCE RECOVERY AND RECYCLING. Preliminary investigations were conducted by parish planners as to the feasibility of resource recovery and recycling as a potential solid waste disposal methodology. State-of-the-art technology did not lend itself to the relatively small production level anticipated for the proposed service area. Therefore, utilization of this alternative was determined to be unacceptable at this point in time, although probable improvements in the existing technology may make it feasible in the future.

SANITARY LANDFILL FOR USE BY DESOTO PARISH ALONE. The studies conducted by the Northwest Coordinating and Development Council (NWCDC) evaluated available disposal methodologies. NWCDC concluded:

"A sanitary landfill is recommended to DeSoto Parish as the most appropriate method of solid waste disposal for the following reasons:

1. *Landfilling, when maintained properly, is environmentally satisfactory to EPA standards.*
2. *DeSoto Parish has received a Farmers Home Administration (601) Assistance Grant for site acquisition and development of a sanitary landfill.*
3. *Landfill is the most economically feasible method of solid waste disposal.*
4. *Landfills adapt easily to high or low peak flows without operational effects."*

Subsequent evaluations conducted by Russell Engineering as part of the "statewide engineering studies" concluded that a sanitary landfill to be utilized for DeSoto Parish as a stand-alone entity would be feasible and environmentally acceptable.

SANITARY LANDFILL WITH POTENTIAL REGIONAL USE. The DPPJ decided to develop a sanitary landfill with potential for regional use. This alternative was evaluated and determined to be the most acceptable on the following basis:

1. Use of a sanitary landfill had proven feasible for DeSoto Parish alone.
2. State planning and regulatory authorities had concluded through statewide studies that regional landfills would be more economical, while reducing potentially adverse environmental impacts.
3. At least one adjoining parish had expressed interest in participating on a tipping-fee basis.
4. Other lands immediately adjacent to the proposed site proved to be readily available, thus allowing for simple expansion of the initial facilities.

As a result, the proposed alternative was to develop a sanitary landfill with potential for utilization on a regional basis, which would result in a minimum of adverse environmental impact, while maintaining economic viability.

CONCLUSION: There are no alternative projects that are considered to offer more protection to the environment without unduly curtailing nonenvironmental benefits. An extensive investigation into the many options was conducted by the DPPJ with assistance from state regulatory agencies and professional consultants. The development and operation of a single sanitary landfill was selected and has proven to be the most environmentally acceptable and affordable option available to DeSoto Parish. The operation of this

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facility has proven to be a boon not only to the parish, but to surrounding areas which deposit their refuse at the landfill. The Mundy Landfill has been an existing facility since 1986, now approaches status as a regional landfill for northwest Louisiana, and is currently receiving requests from other waste haulers for disposal privileges. It has been largely self-supporting from the tipping fees charged for disposal.

Discuss possible alternative sites which would offer more protection to the environment without unduly curtailing nonenvironmental benefits.

The DeSoto Parish Police Jury (DPPJ) made a concerted effort during the planning and original permitting of the landfill in 1984 to locate and utilize the most environmentally acceptable site available. During the search of the entire parish, five sites were eventually inspected and considered. The site selected was further evaluated by qualified engineers and environmental specialists, state and federal environmental protection authorities, and appropriate regulatory agencies.

Site 1. The first site to be considered was an existing open dump at the DeSoto Parish Air Industrial Park. The open dump would have been closed and a new disposal cell meeting the criteria of the Solid Waste Rules and Regulations (SWRR) would have been designed, permitted, and constructed. Site 1 was eliminated from consideration because of its proximity to the air park.

Site 2. A second site approximately two miles southwest of the air park was then investigated. This 80-acre tract was owned by International Paper Company. Consideration was discontinued when the property was found to be too close to the air park and encroached into a flood prone area, and IP was not interested in selling the site for use as a sanitary landfill.

Site 3. After a lengthy search for additional available properties, a third site three miles northeast of Grand Cane, LA was considered. Geological investigation revealed that the subsurface clays, sandy clays, and silty clays were not suitable as an in situ barrier, but groundwater was relatively deep, and impermeable cell and surface impoundment liners could be constructed. This 120-acre had only 50 acres which could be used, a waterway within the site eliminating access to a portion of the site and causing more of it to be within a flood prone area. The major problem was access, which would have required substantial improvements to a one and a half mile long parish road and replacement of a bridge, in order to hold up under the anticipated traffic load. There was also evidence that the road would have to be raised to protect it from overtopping during floods. This site was eliminated from consideration.

Site 4. A fourth property one and a half miles northwest of Holly, LA and 120 acres in size was then investigated. Subsurface soils were again found to be unsuitable, and this groundwater was found near the surface. Site 4 was dropped from consideration.

Site 5. The fifth parcel considered, the current landfill site, was then found and researched. Environmental advantages of this tract included clay subsurface soils, a lack of significant freshwater aquifers, and no flood prone or wetland areas. Other advantages included good access roads, its clear cut condition and availability for sale by International Paper Company, the availability of adjacent properties for sale for future landfill expansion, and a remote location away from residential developments, schools and hospitals, and lignite exploitation areas and central to the proposed DeSoto-Red River parishes service area. The site was not zoned or master planned, had no known historic, archaeological, recreational, or cultural sites, and was not conspicuously known for aesthetic beauty. Its remoteness would tend to minimize potential typical nuisance problems of landfills, such as odors, noise, lights, and traffic.

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Upon preliminary acceptance, a geotechnical study was performed which determined that the clay soils were suitable for compacted clay liners which would conform to SWRR criteria. The LDEQ concurred that the site showed promise and should be looked at further. The Department of Fisheries and Wildlife visited the site and concluded that no adverse environmental impact would result from operation of a sanitary landfill. The U. S. Army Corps of Engineers determined that there was no need for action on its part, since the site could be covered under existing nationwide permits. The firm of Heartfield, Price, and Greene conducted a historic-archaeologic evaluation, which led the Department of Culture, Recreation, and Tourism to issue a letter of "no objection" concerning the proposed landfill.

This research led the DPPJ to conduct detailed studies with the purpose of determining the engineering advantages and disadvantages of the site. It was discovered that the site has an abundance of native soil materials that are worthy as liner, cover, and final cap materials. There were no environmentally sensitive sites to be found in the vicinity, nor did the site encroach on wetlands or flood prone areas. The location of the landfill on a major highway, just one mile from an interstate highway, only six miles from the largest city in the parish, and central to the proposed service area, made it very convenient for both local residents and haulers from other areas. All of these features demonstrated that the site selected was the proper one.

CONCLUSION: The DPPJ made an exhaustive search of available properties in DeSoto Parish during the initial investigation and planning for its solid waste landfill. No other sites were found which offered more environmental protection, either with or without curtailing nonenvironmental benefits. The Mundy Landfill has been in operation since 1986, providing safe, economical, and efficient solid waste disposal for the citizens of DeSoto Parish and surrounding areas.

Discuss and describe mitigating measures which would offer more protection to the environment than the facility, as proposed, without unduly curtailing nonenvironmental benefits.

The Mundy Landfill was, and continues to be, designed, constructed, and operated to meet the latest standards and technology available. The DeSoto Parish Police Jury (DPPJ) has modified the permit continually to upgrade its features and operations as necessary to comply with updates in the LDEQ Solid Waste Rules and Regulations and best serve its purpose of providing for the safe and economical disposal of commercial and residential wastes, construction debris and trash, industrial solid wastes, and asbestos for the residents and businesses of DeSoto Parish and surrounding areas. This Permit Renewal Application began as a mandatory modification of the existing permit required by the SWRR to demonstrate conformance with the current standards. Though the purpose of the application has been changed to permit renewal, its original purpose of demonstrating improvement of existing permitted practices to current standards still applies.

Recent improvements at the Mundy Landfill have been made in order to comply with the 1995 SWRR and the federal Subtitle D regulations. Waste Disposal Cells I - V, all designed and constructed prior to promulgation of the new standards and unable to completely comply with them, were closed at the end of 1997 and have since been capped. Cell VI and Cell VII, Phase 1 conform to all the new standards. The wastewater treatment plant was re-designed and expanded in 1997 to provide better control and treatment of leachate and contaminated stormwater.

The DPPJ has additional improvements and site expansions planned for the near future. The existing groundwater monitoring system will be expanded by the installation of several additional monitoring wells

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to provide better protection of the groundwater. A second sedimentation pond was installed on the west side of the property to de-silt surface water before it exits the site, preventing damage to downstream waterways. Cell VII, Phase 2 ~~and a final phase of Cell VI~~ may be permitted, constructed, and filled to complete the utilization of the currently permitted property as a solid waste landfill. Site improvements on the west side of the permitted property will be designed to complement the future permitting and construction of a new landfill on the 160-acre property owned by the DPPJ immediately to the west. All construction has and will conform to the SWRR, except in certain areas where those criteria were exceeded to ensure environmental protection, and will be permitted by the LDEQ.

There are other improvements that would provide additional protection to the environment and human health. Secondary dual liners with leak detection systems could be installed below composite liners in future disposal cells to provide more protection of the groundwater. Active gas control systems with flares, containment, or recovery and re-use equipment could be installed to replace the installed passive system and its vents to the atmosphere, reducing the currently minimal potential of air pollution. Aerators could be placed in the wastewater treatment plant lagoons, providing further treatment of the leachate and contaminated stormwater prior to discharge, and thus more protection of downstream surface waters. The substantial costs to implement these additional controls, however, cannot be justified by the small reduction they would make in the potential dangers of pollution and human health hazards that are already minimized by the design, construction, and operation of the Mundy Landfill. There have never been any indications of escaped wastes from disposal cells designed according to the appropriate standards, so the dual composite liners have not proven necessary. There have been no complaints or regulatory issues concerning the passive landfill gas venting system utilized, so the installation of a vastly more expensive system would not have improved protection of the air. The discharge monitoring reports for the treatment plant indicate that it has no problem adequately treating leachate to meet the discharge permit, so the addition of aerators would be an excessive and unnecessary expense. The law of diminishing returns and the very limited resources available to rural, undeveloped DeSoto Parish negate the need to implement additional features to a facility which currently conforms to all state and federal regulations pertaining to solid waste disposal and has had no significant problems, events, or accidents in its 16-year history. Implementation of such measures could push the cost of solid waste disposal beyond the limited means of the DPPJ, without a corresponding tangible benefit.

CONCLUSION: The Mundy Landfill has a history of being consistently upgraded and improved by the DPPJ to remain in compliance with all pertinent state and federal regulations, available solid waste disposal technology, and environmental protection requirements. This history has resulted in a corresponding traditional lack of significant problems at the facility. While there are additional measures that could have been or could be implemented, those measures are not required by LDEQ or EPA for this facility, probably would not make a significant beneficial impact on the performance of the landfill, and could make proper solid waste disposal in DeSoto Parish uneconomical. The DPPJ will continue to improve the site when required to ensure compliance to all environmental regulations and needs, and will continue to operate the Mundy Landfill in a manner to provide to the residents of DeSoto Parish and surrounding areas the benefits of economical, efficient, and environmentally safe solid waste disposal.

*Mundy Landfill
Modification No. 2*

ATTACHMENT B-4

Appendix L: Closure Plan

*Mundy Landfill
Closure Plan*

CLOSURE PLAN

MUNDY LANDFILL

DESOTO PARISH, LOUISIANA

CLOSURE PLAN MUNDY LANDFILL

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CLOSURE PLAN MUNDY LANDFILL DESOTO PARISH, LOUISIANA

1.0 INTRODUCTION

This Closure Plan has been developed for the Mundy Landfill located near the town of Mansfield in DeSoto Parish, Louisiana. This plan addresses the requirements of the Louisiana Solid Waste Rules and Regulations (LAC 33:VII.521.J) and Federal Regulations (40 CFR Part 258, Subpart F) for closure of a municipal landfill.

On April 30, 1985, the DeSoto Parish Police Jury received Permit No. P-0035 from the State of Louisiana, Department of Environmental Quality (LDEQ), to operate the Mundy Landfill. The facility is a Type I/II/III ~~II and Type III~~ landfill receiving non-hazardous municipal and commercial solid waste; construction demolition debris/woodwaste; and, asbestos as specified in the facility permit and approved modifications.

The landfill site is located in Section 3, Township 12 North, Range 12 West, in DeSoto Parish, Louisiana, as shown on the General Location Map presented in Figure CP-1. The site encompasses approximately 62 acres, of which approximately 49 acres are currently permitted for waste filling. The currently permitted landfill area and the five additional acres proposed under Modification No. 31 (three acres are over closed cells) are shown on the Final Contour Plan presented in Figure CP-2. Waste filling of the cells is generally performed sequentially, with a cell filled or nearly-filled before filling begins in another cell.

This plan includes a description of the steps that have been or will be undertaken to close each filled landfill area, a general schedule for closure, a description of the final cover system and the methods used to install the cover. Information supplemental to this closure plan, such as full-scale landfill design drawings and a description of groundwater and methane monitoring system design, are included in the Permit Renewal Application. The user of this Plan should also refer to the Responses to 521.J in that Application.

2.0 CLOSURE REQUIREMENTS

2.1 Notification Requirements. The LDEQ will be notified in writing at least 90 days before final closure or intent to finally close, seal, or abandon any individual units within the landfill. The notification will include the date of planned closure, changes (if any) requested in the approved closure plan, closure schedule, and estimated closure cost.

2.2 Maximum Waste Inventory. The maximum waste disposal capacity for the landfill area was calculated and is tabulated below.

Unit	Maximum Waste (Tons)	Type Of Waste
Cells I-V	347,000	II
Cell VI	185,000	II
CD&T - South	20,000	III
ASB-1	3,000	Asbestos
ASB-2	2,000	Asbestos
Subtotal	557,000	-
Cell VII, Phase I	218,000	II
CD&T - North	246,000	III
Total	1,021,000	-

The sources for these figures are given at the Response to 521.J.2.c. in the Permit Renewal Application.

The estimated total waste storage capacity of the Mundy Landfill is roughly 1.02 ~~0.76~~ million tons including the ~~0.22~~ million tons in the vertical expansion sought under Modification No. 3~~1~~. The Final Contour Plan for the completed landfill is shown on Figure CP-2.

2.3 Estimated Closure Costs. The estimated cost of closure of the facility, based on the cost of hiring a third party to close the facility at the point in the facility's operating life when the extent and manner of its operation would make closure the most expensive, is presented on Table CP-1. Cells I-V and ASB-1 were closed prior to the date of this submittal. The estimated cost may be revised at a later date due to new information on which to base all estimates. Revised estimates will be submitted in the form of a closure plan modification.

2.4 Facility Record Keeping Requirements. Copies of closure certifications for each unit closed before final facility closure and a copy of the approved closure plan and any subsequent LDEQ approved amendments and changes will be kept on file at the landfill site until the owner is released from the requirements for closure and post-closure care. Evidence of a financial assurance mechanism for closure and post-closure care costs is included in the Permit Renewal Application.

3.0 CELL CLOSURE COVER DESIGN AND INSTALLATION

The final closure cover is designed to assure that the landfill cells are closed in a manner that minimizes the need for further maintenance and controls, including the minimization of infiltration and erosion. The closure requirements discussed in this section pertain to areas of the landfill that have not been previously closed, or are still receiving waste. The procedures used for the units already closed are included for completeness.

3.1 Preclosure Requirements. A major site development objective is to manage the filling activities such that finished grades are achieved on a progressive basis. In this way, placement of at least portions of final cover takes place throughout the life of the site. The largest area of the landfill still requiring final cover at any time during the remaining active life is Cell VI, the CDW Cells, ASB-2, and Cell VII, Phase 1 (when permitted), a total of about 21 acres. A schedule, based on the closure of this area, for completing all activities necessary for closure is presented on Table CP-2.

Closure will be initiated no later than 30 days after and be completed no later than 90 days after final grades are achieved in the unit or after the date of known final receipt of solid waste in the cell, whichever comes first. This schedule may be extended by the LDEQ, if necessary, due to inclement weather or other circumstances up to a maximum of 60 days for initiation and 180 days for completion.

Prior to closure of any unit, standing water will be processed or removed. An insect and rodent inspection will be performed and documented and, if necessary, extermination measures will be provided. Installation of daily and/or interim cover plus final machine compacting and grading will be completed prior to initiating final cover placement. The run-off diversion system will be maintained until the final cover system is installed, and will be modified, if necessary, to prevent overflow of surface water runoff from the landfill.

3.2 Cover System Design and Installation. Final cover will be installed directly over the daily or interim cover that will serve as a grading layer to provide a stable base for subsequent layers. The type of cover system installed depends the cell which is undergoing closure, as discussed below. All final cover construction will be subject to QC/QA inspection and testing as mentioned in Section 3.8 of this Closure Plan.

3.3 Cells I-V. These cells were constructed prior to pre-Subtitle D regulations. For these cells, the closure cover installed consisted of a minimum of two feet of compacted clay meeting a permeability of 1×10^{-7} cm/sec or less, overlain by a minimum of six inches of soil capable of sustaining vegetative growth. The side slopes were no steeper than about 25 percent and no flatter than four percent.

3.4 Cell VI. This cell has a Subtitle D bottom composite liner system consisting of a minimum three-foot compacted clay liner overlain by a 60-mil high density polyethylene (HDPE) liner. The final slopes are no steeper than about 25 33 percent and no flatter than four percent. The cover system to be installed is described as follows (from bottom to top):

- a minimum of two feet of compacted clay cover with a permeability of 1×10^{-7} cm/sec or lower;
- a minimum 60-mil HDPE synthetic liner installed directly over the compacted clay cover over slopes flatter than 4H:1V; and,
- minimum ~~18~~ 6-inch thick vegetative soil layer installed directly over the geosynthetic liner. This layer has to be capable of sustaining vegetative seed and growth.

3.5 CD&T Cells. The final cover will consist of at least 24 inches of clay or silty clay topped with six inches of topsoil as a vegetative layer. The area will be graded to drain prior to installation of the final cover.

3.6 Cells ASB-1 and ASB-2. Cover for these units is installed as the waste material is placed in accordance with the provisions of Modification Nos. 8 and 17. Final closure will consist of grading for drainage (by filling-no cutting allowed) and seeding.

3.7 Cell VII, Phase 1. The final cover will be of two types

- Slopes of ~~1(V):6(H)~~ 1(V):4(H) or flatter (the top of the vertical expansion area): the final cover will be as described above for Cell VI, ~~but with a six-inch thick vegetative layer.~~
- Slopes steeper than ~~1(V):6(H)~~ 1(V):4(H): the final cover will be as described above, except that the HDPE layer will be omitted.

Details of these cover systems are presented on Figure CP-3. The installation methods for the cover system are described in Section 3.8 of this Closure Plan.

3.8 General Cover Construction.

Clay Cover: Material used for compacted clay cover will be selected to meet the requirements within the Specifications of Section 02222, in Appendix B of Modification No. 31. Installation of the clay cover will be performed by placing nominal eight-inch thick loose lifts of clay fill that are free of foreign material. The lift thickness will be adjusted, if necessary, to achieve the desired permeability. The moisture content of the clay shall generally be from one to four percentage points above the optimum moisture content for the material, as determined by the Standard Proctor Test Method (ASTM D-698), or as otherwise specified by the supervising engineer to achieve the required permeability. The lifts of clay fill will be compacted. Density testing of the in-place compacted lifts and permeability testing of undisturbed samples of the clay cover will be performed by the Construction Quality Assurance (CQA) Monitor in accordance with the testing frequencies specified in the cited Section 02222. Portions of the clay cover that do not exhibit the required permeability will be reworked and retested until compliance is achieved.

Synthetic Cover: The HDPE liner will be installed immediately over the clay cover. Panels of the synthetic cover will be deployed, welded, and leak tested in accordance with standard procedures for installation of synthetic liners. CQA activities will be performed during the synthetic cover installation in accordance with the Section 07181 of Appendix B of Modification No. 31.

Vegetative Soil Cover: A minimum six-inch thick vegetative soil cover will be installed over the barrier layers. The soil will be capable of supporting a native grass cover. The final grade of this soil layer will be a minimum of four percent and a maximum of 33 percent depending on the cell. Specific thickness requirements for each cell were mentioned above. The slopes shall conform to those given on Figure CP-2.

The cover system installation will be performed with verification by a CQA monitor supervised by a professional engineer registered in the state of Louisiana. The engineer's certification report will be submitted to the LDEQ within 90 days after closure is completed.

After LDEQ has inspected and approved the final cover of each closed landfill area, the approved area will be fertilized and planted with native grass seed or other shallow-rooted vegetation to promote good growth and easy care, and to minimize soil erosion. An appropriate seedbed is prepared by disking the topsoil to a depth which precludes any damage to the top of the final cover. Soil amendments (Fertilizer, lime, etc.) are applied based on analysis of the topsoil material being utilized and the ground cover to be planted. A perennial herbaceous cover is established by seeding with common Bermuda grass or other appropriate species, according to technical guidelines for erosion control published by the U.S.D.A. Soil Conservation Service, and as approved by the Department.

Following stabilization of the site and the establishment of appropriated ground cover, the LDEQ and the Louisiana Office of Forestry will be consulted concerning suggestions for the planting of species of vegetation appropriate for the soils, climate, and final intended use of the reclaimed site. The species selected will not have growth characteristics (i.e., taproots, etc.) which could compromise the final liner.

Erosion Protection - Cell VII, Phase 1: Special measures will be taken for this unit because of its relatively steep slope. The final cover detailed contour plan shall include provisions for terracing and let-down chutes as illustrated on Sheets 12-18 and 27 of Permit Modification No. 31. The let-down chutes shall be armored with erosion protection (three inches of crushed limestone or an equivalent approved by the Landfill manager).

Closure will be considered complete after the final cover has been inspected and approved, and the vegetative cover has been placed. Final closure of the site will be achieved when all cells have been filled and closed.

3.9 Gas System. A gas removal system will be installed in general accordance with the conceptual design presented in the Permit Renewal Application. Closure of Cells VI and VII, Phase 1 will begin with the installation of the landfill gas removal system of perforated piping. Cell VI is illustrated on drawing STE-T2 ~~Sheets 27 and 28 of the design drawings~~ in Appendix I of the Permit Renewal Application and described in §521.F.6 of that application. Cell VII is illustrated on Sheet 27 of Appendix P of the Permit Renewal Application and described in the response to §521.F.6. Trenches will be cut through the daily/interim cover and into the top of the disposed wastes. These trenches will be filled with hand-placed and compacted crushed stone, which will envelope the gas system piping. Vents will be installed to protrude through the final cap on intervals

*Mundy Landfill
Closure Plan*

of no more than 100 feet.

4.0 ANCILLARY FEATURES

4.1 Wastewater Treatment Plant. The treatment plant will be closed at the end of the post-closure period, which will allow the treatment of leachate generated by the closed disposal cells during the post-closure period. Closure of the plant will be performed in a manner conforming to the requirements of the state and federal water discharge permits issued to the landfill, and as described below. Closure will not require the installation of a final cap, since the ponds will be removed in their entirety. First, the plant water will be tested to verify that discharge standards are met. Then, the plant will be drained. Upon completion of drainage, the compacted clay oxidation pond liner will be de-silted and excavated and removed. Leachate transmission piping into the plant will be plugged or removed. All materials removed will be disposed in a properly licensed industrial waste facility. The program will include verification sampling and testing of the subgrade soils to ensure that no contamination exceeding LDEQ RECAP standards remains.

Additional fencing, with a locked gate, will be installed around the treatment plant, with posted signage to deter unauthorized entry and warn of potential dangers. The plant outfall will have a locked valve to preclude tampering or unauthorized drainage of the pond, and the fencing will extend around the outfall to further hinder unauthorized access. This fencing will remain in place until the treatment plant is dismantled and removed at the end of the post-closure period.

4.2 Sedimentation Pond. The surface water pond constructed for the containment and sedimentation of uncontaminated surface runoff will remain as a permanent unfenced impoundment, for use as wildlife habitat and maintenance water source.

4.3 Other. Existing buildings, roads, and facilities will remain in use as long as they are needed through the closure and post-closure periods. As individual features are no longer required, they will be removed or otherwise abandoned. Existing fencing will remain in place until notification is submitted to and approved by the LDEQ that this fencing is to be removed. The gate at the site entrance will be kept locked, except during periods of inspection, maintenance, or other entry by authorized personnel during the post-closure period.

During the post-closure period, manholes and cleanouts on the leachate collection and transmission system will be modified to provide locking covers to prevent unauthorized access. After post-closure, leachate transmission piping will be plugged with a minimum of two feet of concrete and a welded cap of compatible material and then abandoned in place, or removed in its entirety and disposed of in an industrial waste landfill. The contaminated stormwater system from the Cells I - V to the treatment plant was abandoned in 1997 as part of the construction of the Waste Disposal Cell VI, including the plugging of the piping and the manholes with concrete. This piping will remain in place or be removed, depending on the disposition of the leachate transmission piping.

5.0 CLOSURE DOCUMENTATION

5.1 Closure Certification. The closure activities will be monitored by a professional engineer, registered in the State of Louisiana, and having the requisite expertise, in order to assure that closure has proceeded according to the approved closure plan. The professional engineer will supervise the CQA monitor(s) and will submit final written certification to the LDEQ that the final cover was completed in accordance with the approved closure plan. The certification will be submitted within 90 days after completion of the final cover over each landfill area. It will also contain all as-built and testing information concerning closure.

5.2 Documentation for Parish Records. Following placement of final cover over the entire landfill, the DeSoto Parish Police Jury will update the DeSoto Parish mortgage and conveyance records by entering the specific location of the facility and specifying that the property was used for the disposal of solid waste. The document will identify the name and address of a person with knowledge of the contents of the facility. A copy of the form to be used for this purpose is presented as Attachment A in this Closure Plan. A true copy of the completed form, certified by and filed with the Desoto Parish Clerk of Court, will be provided to the LDEQ.

5.3 Contact Person. The name, address, and telephone number of the person or office to contact about the facility after closure will be provided to the LDEQ upon notice of closure. At this time, post-closure use of the landfill facility remains uncertain. The final landfill cover will not be disturbed without prior approval from the administrative authority.

TABLES

**TABLE CP-1
ESTIMATED CLOSURE COSTS**

Unit	Area (Acres)	Cost (\$K)	Status
Cells I-V	17.4	Complete	Closed
Cell VI	7.1	724 <u>410</u>	Active
CD&T-S ^a	3.8	31	Active
ASB-1	1.5	0	Closed
ABS-2	1.8	17	Active
Wastewater	--	24	Active
Subtotal	31.6	796 <u>482</u>	--
Cell VII, Phase 1 ^b	8.0	595	Active
<u>CD&T-N</u>	<u>7.0</u>	<u>342</u>	<u>Proposed</u>
Total	39.6	1391 <u>1419</u>	--

^a 2.2 Acres already closed: 1.6 acres to close.

^b By ratio from Cell VI data (attached).

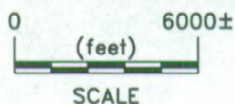
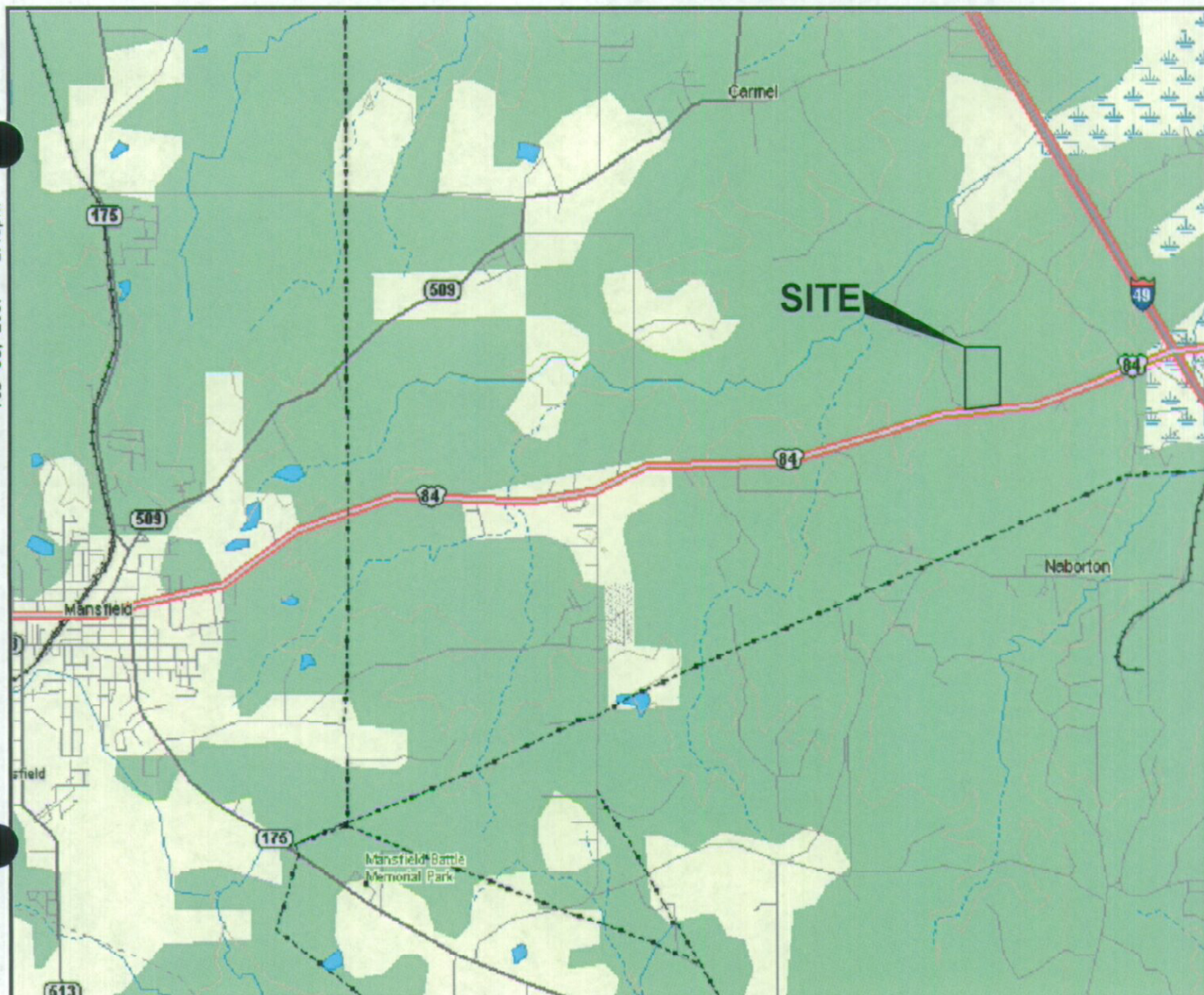
TABLE CP-2
ESTIMATED CLOSURE SCHEDULE

Item	Estimated Closure Date
Cells I-IV	2000
Cell VI	2005
<u>CDW - South</u>	<u>2007</u> 2010
ASB-1	2000
ASB-2	2010
Cell VII, Ph 1	2010
<u>CDW - North</u>	<u>2010</u>
Wastewater	2040

*Mundy Landfill
Closure Plan*

FIGURES

Feb 08, 2007 - 2:48pm



**MUNDY SANITARY
LANDFILL**
MANSFIELD, LOUISIANA

for
**DESOTO PARISH POLICE
JURY**
MANSFIELD, LOUISIANA

JONES ENVIRONMENTAL, INC.
SHREVEPORT, LOUISIANA



STE

Soil Testing Engineers, Inc.

Baton Rouge, LA Lake Charles, LA Metairie, LA

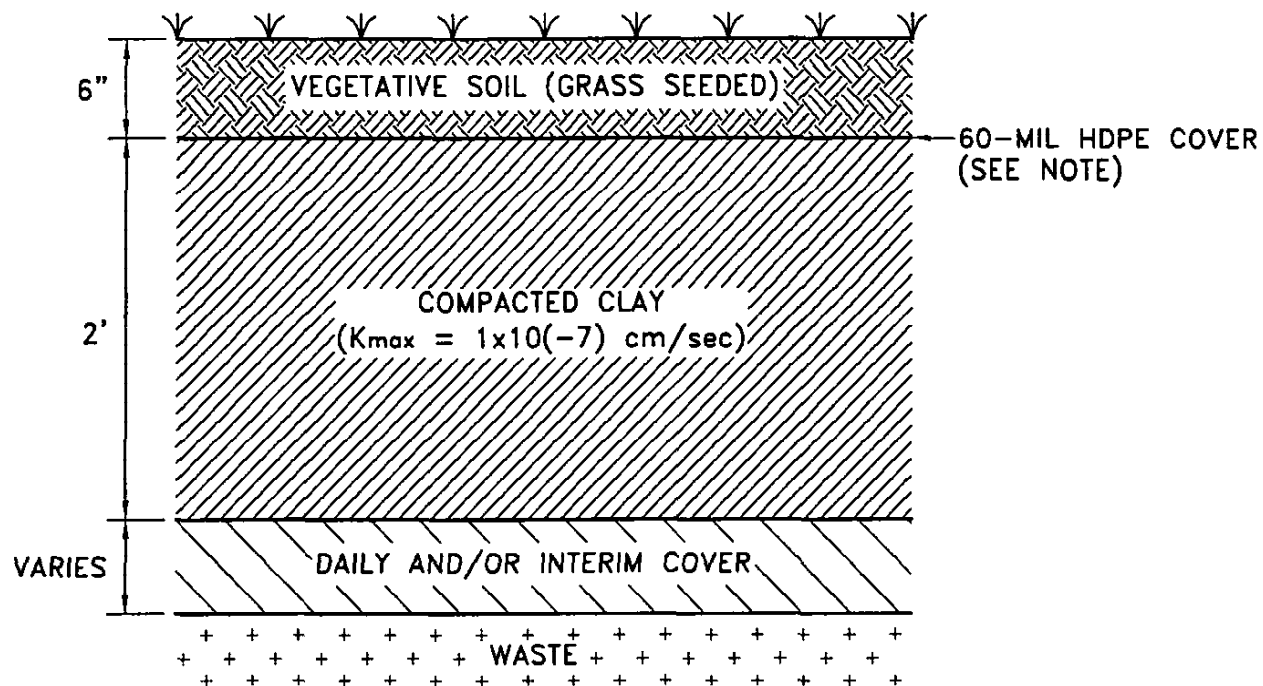
Project Engineer: **K. McNamara** Drawn by: **DMS** Checked by: *[Signature]*

File No.: **05-1157** Date: **6-07-06** Figure No.: **CP-1**

Title: **GENERAL LOCATION MAP**



REFERENCE:
USGS Quadrangle Maps of Bayou
Pierre Lake, LA, 1992 edition and
Mansfield, LA, 1980 edition.

Dec 27, 2006 - 9:25am



NOT TO SCALE

NOTE:
THE 60-MIL HDPE COVER WILL BE
INSTALLED OVER THE SLOPES FLATTER
THAN 1(V):4(H) THAT OVERLIE A CELL
WITH A COMPOSITE LINER SYSTEM.

1	12/06	UPDATE	RDA
REV.	DATE	DESCRIPTION	BY
MUNDY SANITARY LANDFILL MANSFIELD, LOUISIANA			
for DESOTO PARISH POLICE JURY MANSFIELD, LOUISIANA			
JONES ENVIRONMENTAL, INC. SHREVEPORT, LOUISIANA			
 STE Soil Testing Engineers, Inc. Baton Rouge, LA Lake Charles, LA Metairie, LA			
Project Engineer:	Drawn by:	Checked by:	
K. McNamara	DMS		
File No.:	Date:	Figure No.:	
05-1157	6-07-06	CP-3	
Title: FINAL COVER DETAIL			

P:\2005\05-1157-CP03 REV COVER DETAIL.DWG

*Mundy Landfill
Closure Plan*

ATTACHMENT

CLOSURE OF A SOLID WASTE DISPOSAL FACILITY

The DeSoto Parish police Jury hereby notifies the public that the following described property was used for the disposal of solid waste. This site was closed on *(date facility was closed)* in accordance with the Louisiana Administrative Code, Title 33, Part VII. Inquiries regarding the contents of Mundy Landfill may be directed to the DeSoto parish Administrator or the DeSoto Parish Superintendent of Solid Waste at the DeSoto parish Police Jury, P.O. Box 898, Mansfield, Louisiana, 71052, 318-872-0738.

Property Description:

Section 3, Township 12N, Range 12W, DeSoto Parish, Louisiana

Coordinates: Lat. 32 degrees, 3 minutes, 30 seconds
Long. 93 degrees, 35 minutes, 30 seconds

Beginning at the Northwest (NW) corner of Section 3, T12N, R12W; thence south 88°43'40" east for a distance of 1306.99 feet; thence south 0°37'08" west for a distance of 1982.85 feet; thence south 84°24'17" west along the northern right-of-way of U.S. Highway 84 for a distance of 1321.13 feet; thence north 0°47'31" east for a distance of 2140.77 feet to the point of beginning and containing 62.007 acres.

William C. Smith
DeSoto Parish Administrator

Date

(A true copy of the document certified by the parish clerk of court must be sent to the LDEQ Office of Environmental Services, Permits Division, Post Office Box 4313, Baton Rouge, LA 70821-4313.)

*Mundy Landfill
Modification No. 2*

ATTACHMENT B-5

Appendix I: Financial Assurance

ENGINEERING OPINION OF PROBABLE COSTS FOR FACILITY CLOSURE

Costs enumerated below are for closure of the landfill as discussed in §521.J. Final cap installation will only be necessary over Cells CD&T-N, VI and VII, the other five putrescible waste disposal cells and the non-putrescible waste disposal area having already been closed in 1997, and the asbestos disposal areas being capped as disposal is made.

ITEM	UNIT OF MEASURE	QUANTITY	UNIT COST	TOTAL COSTS
Pre-closure procedures	Lump Sum	1	<u>12,500.00</u> 10,000.00	<u>12,500.00</u> 10,000.00
Clay cap installation, to include material excavation, hauling, placement, compaction, grading, and testing.	Cubic Yard	<u>46,858</u> 35,000	10.00	<u>468,580.00</u> 350,000.00
Synthetic HDPE cap installation	Square Yard	<u>20,970</u> 50,000	4.50	<u>94,370.00</u> 225,000.00
Erosion control, to include topsoil hauling, placement, grading, and seedbed preparation	Cubic Yard	<u>11,065</u> 8,100	10.00	<u>110,650.00</u> 81,000.00
Soil amendments	Lbs.	<u>12,500</u> 10,000	0.50	<u>6,250.00</u> 5,000.00
Seeding	Lbs.	<u>438</u> 350	15.00	<u>6,570.00</u> 5,250.00
Planting	Lump Sum	1		<u>9,380.00</u> 7,500.00
Trenching for landfill gas system installation	Linear Feet	<u>500</u> 775	2.50	<u>1,250.00</u> 2,000.00
Gravel fill for gas pipe trench	Cubic Yard	<u>12</u> 30	10.00	<u>120.00</u> 300.00
Gas collection pipe installation	Linear Feet	<u>500</u> 775	10.00	<u>5000.00</u> 7,750.00
Gas vent riser installation	Linear Feet	<u>56</u> 20	10.00	<u>560.00</u> 200.00

Mundy Landfill
Permit Renewal Application

ITEM	UNIT OF MEASURE	QUANTITY	UNIT COST	TOTAL COSTS
Gas vent riser caps	Each	<u>8</u> 20	25.00	<u>200.00</u> 500.00
Concrete pads for vent risers	Each	<u>8</u> 20	50.00	<u>400.00</u> 1,000.00
Lockable manhole covers	Each	11	500.00	5,500.00
Lockable cleanout covers	Each	1	100.00	100.00
Fencing, around asbestos areas	Linear Feet	1,000	10.00	10,000.00
Fencing, around treatment plant	Linear Feet	1,800	10.00	18,000.00
Lockable treatment plant discharge valve	Each	1	250.00	250.00
TOTAL COST				<u>\$749,680.00</u> 729,350.00

**STE**

Soil Testing Engineers, Inc.

316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884Telephone (225) 752-4790
FAX (225) 752-4878

Project: Mundy CD&T-N Client: DeSoto Parish Job #: 05-1157
 By: KTM Checked by: _____ Date: 6-9-06 Sheet 1 of 3

Closure Cost Adjustments for Cell CD&T-N

Cell CD&T-N \approx Cell VI in size \therefore Preclosure

\$5,000

Clay Cover

 $(\text{Area}) (3.0') (2') (\$10.00)$ $(304,920) (1.05) (2') (10) (1/27) \$237,160$

Erosion

 $(304,920) (1.05) (0.5) (10) (1/27) \$59,290$

Soil Amendments

 $(5000 \text{ lb}) (\$0.50)$

\$2,500

Seeding (175) (\$15)

\$2,625

Planting

\$3,750

Synthetic Cover

 $(48,000 \text{ sf}) (1/9) (4.5)$

\$24,000

Trenching

500' (\$2.50)

\$1,250

 $12 \times 12 = (16 \text{ ft})$

144

 $= 0.165 \text{ sf}$ $\times 500'$ $\approx 330 \text{ sf}$

Gravel (330 sf) (1/27) (\$10)

\$120

Pipe Install (500) (\$10)

\$5000

**STE**

Soil Testing Engineers, Inc.

316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884Telephone (225) 752-4790
FAX (225) 752-4878

Project: Mundy Cell CDST-N Client: DeSoto Parish Job #: 05-1157
 By: KTM Checked by: _____ Date: 6/9/06 Sheet 2 of 3

Gas vent install

$$7' \times 8' \text{ risers} = 56' @ \$10.00 \quad \$560$$

Riser Caps

$$8 @ 25.00 \quad \$200$$

Concrete Pads

$$8 @ 50.00 \quad \$400$$

$$\underline{\$341,860}$$

Closure Cost Reductions for Cell VI

Half of Cell VI is covered by Cell CDST-N

≈ 3.5 acres

$$\therefore \text{Preclosure } 5000 \left(\frac{1}{2}\right) = -\$2,500$$

Clay Cover

$$(152,460 \text{ sf})(1.05)(2')(\$10.00)\left(\frac{1}{27}\right) = \$118,580$$

Erosion

$$(152,460 \text{ sf})(1.05)(0.5')(\$10)\left(\frac{1}{27}\right) = \$29,640$$

Soil Amendments

$$(5000 \text{ lb})\left(\frac{1}{2}\right)(\$0.50) = \$1,250$$

Seeding

$$175 \left(\frac{1}{2}\right)(\$15) = \$1310$$

Planting

$$\$3750 \left(\frac{1}{2}\right) = 1870$$

**STE**

Soil Testing Engineers, Inc.

316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884Telephone (225) 752-4790
FAX (225) 752-4878

Project: Mundy Cell CD&T-N Client: DeSoto Parish Job #: 05-1127
By: KTM Checked by: _____ Date: 6/9/06 Sheet 3 of 3

Synthetic Cover

(309,276 sf) (1/4") (4.50)

-\$154,630

Trenching

-2,000

Gravel fill

- 300

Dipe Install

-7,750

Riser Install

- 200

Riser Caps

- 500

Concrete Pads

-1,000

\$321,530

*Mundy Landfill
Modification No. 2*

ATTACHMENT C

ENVIRONMENTAL ASSESSMENT STATEMENT

ENVIRONMENTAL ASSESSMENT STATEMENT

INTRODUCTION

An Environmental Assessment Statement (EAS) addressing the questions promulgated by the Louisiana Supreme Court is required by regulation under LAC 33:VII.523. In addition, this requirement was amplified and codified into law as LRS 30:2018.B.

This EAS has been prepared to respond to the above requirements for Cell CD&T-N of the Mundy Landfill.

Facility Background: The Mundy Landfill, Facility No. D-031-1827, has been in operation since 1986 under Standard Solid Waste Disposal Permit P-0035, issued by the Louisiana Department of Environmental Quality (LDEQ) on April 30, 1985. Permitted as a Type II (commercial and residential solid waste)/Type III (construction debris and trash) landfill, the facility was constructed in 1985 and received its first waste disposal in early 1986. The approved 2004 Permit Renewal Application included permit information for the facility to accept Type I (industrial) waste.

From a small parish landfill, the facility has grown to a point where it approaches status as a regional landfill for northwestern Louisiana. Sources of wastes currently being deposited at the Mundy Landfill include DeSoto Parish and Red River Parish, the City of Mansfield, various individual generators in the East Texas counties of Shelby, Center, and Panola, and Waste Management, Inc. Several other agencies have inquired about disposing of wastes at this facility. The DeSoto Parish Police Jury (DPPJ), owners of the site and the permit, have an unlimited service area from which to solicit haulers and depositors of wastes.

Purpose: The DPPJ had three reasons for implementing plans for a solid waste disposal facility. First and foremost was the safe and efficient disposal of waste materials generated by parish residents. Prior to 1984, there were numerous open dumps in DeSoto Parish, and many more areas where solid waste was simply dumped by the side of the road. This resulted in unsightly and unsanitary conditions which threatened the environment and the health, safety, and quality of life of residents. The permitting and construction of a sanitary landfill, the organization of the DPPJ's Solid Waste Committee (SWC), and the enactment of an ordinance preventing littering all had the purpose of meeting these needs and eliminating these problems.

Federal and state environmental agencies were at that time laying the foundations for regulations requiring proper solid waste disposal. The DPPJ realized that the open dumps would have to be closed in the near future and governmental bodies like itself would be held responsible for the containment, regulation, and monitoring of solid waste disposal in areas under their jurisdiction. Construction of a landfill would not only provide for the needs of DeSoto Parish, but the lack of such facilities in the region raised the possibility of a revenue-generating business for the parish. Red River Parish and the City of Natchitoches were original partners with the DPPJ in the venture, and Red River Parish continues to deposit its solid waste at the Mundy Landfill.

The SWC and the landfill filled two additional crucial needs for DeSoto Parish. A rural area with high unemployment and a population of low- to middle-income residents, the parish needed employment opportunities for its citizens. Many people work for the landfill who otherwise would probably be unemployed. The operation of a landfill also generates revenues that pay for parish solid waste disposal that would otherwise have to be funded by tax increases.

The Cell CD&T-N expansion of the Mundy Landfill will allow the facility to continue to provide these necessities for the residents of the parish and surrounding communities by continuing to allow non-putrescible wastes to be disposed of in a cell especially for such waste. Putrescible waste cells are expensive to construct and this expansion will allow DeSoto Parish to fill the higher priced putrescible cells with putrescible waste by keeping non-putrescible waste out of the cells. The site includes or will continue to use features that minimize potential environmental and health risks (see below). Cell liners, leachate systems, and groundwater monitoring wells protect the groundwater. Surface runoff/runon measures, a wastewater treatment plant, and sedimentation ponds protect surrounding surface waters. Disposal cell closure caps and landfill gas monitoring procedures and equipment protect air quality.

Development: The facility currently has:

- five putrescible waste disposal cells (Cells I-V) constructed under the pre-Subtitle D regulations, all of which were closed at the end of 1997;
- two putrescible waste disposal cells (Cell VI and Cell VII) which are designed to meet the Subtitle D regulations (updated regulations from the U. S. Environmental Protection Agency) and updated Solid Waste Rules and Regulations SWRR).
- a construction debris and trash waste disposal area (previously called the CD&T cell; now to be known as Cell CD&T-S in order to distinguish it from the proposed CD&T cell to the north, Cell CD&T-N); and,
- two asbestos disposal areas.

Supporting features include a perimeter fence with a gate at the entrance on U.S. Highway 84, an office building and scales at the gate, interior access road, wastewater treatment plant, three sedimentation ponds, storage shed, mechanics shop, and a groundwater monitoring well system.

An estimation of the design capacity of the Mundy Landfill, assuming values for quantities of wastes to be disposed up to the times of individual cell closures, was provided in Appendix J of the Permit Renewal Application. Cell CD&T-N will continue services for the disposal of Type III wastes by providing an additional 246,000 tons of capacity for that purpose.

Conclusion: The Mundy Landfill is sited in a remote, undeveloped area of DeSoto Parish. There is no current zoning or master plan for the area, and no development anticipated in the foreseeable future. There are few real adverse effects that have resulted from the operation of the Mundy Landfill, those being the occasional unavoidable problems which are inherent to solid waste disposal, and which are more nuisances than real problems. Significant adverse effects,

such as air, water, and groundwater pollution, have been prevented by the planning, siting, design, construction, improvement, and operation of the facility. The landfill was built to improve the previous solid waste management system in DeSoto Parish, which had consisted of open dumps and littering. During its history, the Mundy Landfill has fulfilled this purpose.

The Mundy Landfill was, and continues to be, designed and operated to meet the latest standards and technology available. The DPPJ has modified the permit continually to upgrade the landfill as necessary to comply with updates in the SWRR, improve its features and operations, and best serve its purpose of providing for the safe and economical disposal of commercial and residential wastes, construction debris and trash, industrial solid wastes, and asbestos for the residents and businesses of DeSoto Parish and surrounding areas. The expansion of this facility with a new CD&T cell (Cell CD&T-N) will continue this history.

The following sections demonstrate that the Mundy Landfill meets the high environmental standards not only of the LDEQ, but also those of the Louisiana Legislature and Supreme Court.

Discuss how the potential and real adverse environmental effects of the facility have been avoided to the maximum extent possible.

There are many potentially harmful environmental effects from improper solid waste disposal. However, the inert character of materials placed in Type III landfills generally pose the least risk, as reflected in the regulatory guidelines for their design and operation. The waste disposal techniques and procedures developed for the Mundy Landfill prevent environmental damage from regulated disposal of solid wastes, as well as the much more serious effects that would occur if such a facility were not used. The design, construction, and operation of Cell CD&T-N and the infrastructure of the Mundy Landfill system prevent such consequences in the following ways.

GROUNDWATER EFFECTS. Possibly the worst of the potential harmful effects of solid waste disposal is groundwater pollution, because of the difficulties in detecting and correcting this type of contamination, and the importance of uncontaminated groundwater for local water supplies.

The first step in preventing groundwater pollution is selection of a site which minimizes the chance of this happening. Some of the many advantages of the site include the thickness of the layers of native clay materials below the ground surface, the suitability of those materials for compacted clay liner and cap construction, and the depths of aquifers used for water supplies, all of which are crucial to the protection of groundwater. The Naborton formation is a subterranean formation of very dense clay up to 450 feet thick. The density of this material makes penetration of it by groundwater very slow and difficult. Groundwater travels much faster through sand and silt layers, and since liquids typically flow in the direction of least resistance, the clays below and above sand and silt layers usually confine groundwater flow to those layers. Aquifers in the vicinity of the landfill that are used for drinking water are at depths that allow construction of disposal cells and treatment ponds above the surface of the groundwater table, although there are

some thin sand zones near the surface. The location of the regional aquifers deep beneath the landfill, with over one hundred feet of natural clay separating them from disposed waste materials, protects the groundwater from contamination.

The second step in preventing groundwater pollution is the use of environmental barriers to separate groundwater from disposed wastes. Construction requirements for sanitary landfills include low permeability liners and caps to contain wastes within disposal cells, while keeping groundwater out, and wastewater systems to collect and treat leachate and contaminated stormwater before releasing it to the environment. Cell CD&T-N is situated on top of and in the valley between existing cells whose bottom liners include compacted clay materials that are a minimum of three feet thick, with densities and permeabilities that are superior to even the natural clay materials, resulting in several feet of very dense and impermeable clay between disposed waste materials and the environment. A significant portion of the CD&T Cell will be placed on top of Cell VI. Cell VI complies with improved construction techniques that include a composite liners with a plastic membrane installed on top of the clay liner, for added containment of leachate within the cell. The combination of recompacted clay liner and plastic liner is superior to either alone at preventing seepage of leachate out of the cell. The plastic is installed as panels that are overlapped and welded at their seams, which makes the seams as strong and impermeable as the panels themselves. When construction is complete, the plastic is essentially an impermeable "bowl" which contains the waste materials and keeps them from contaminating groundwater. The leachate collection systems in the cells underlying Cell CD&T-N, collect leachate and transport it to the onsite treatment plant. These systems are described in detail in the current Permit Renewal Application. These features protect groundwater by keeping waste solids within the cell and allowing liquid wastes (leachate) to be removed for treatment at the onsite wastewater plant.

When the available space is exhausted in a cell, disposal is discontinued or relocated to another area, and the cell is closed. Closure includes materials and procedures that keep rainfall and surface runoff out of the cell and away from the disposed wastes. This separation prevents the water from becoming contaminated by contact with decomposing putrescible waste materials. The closure cap installed over the waste materials is composed of native clay compacted to a final thickness of at least two feet and to the permeability required for the cell liner. Cell CD&T-N will have a plastic cover, similar to the HDPE liner discussed above, placed on slopes flatter than 6H:1V which extend over the Cell VI footprint.. The plastic will be installed over clay component of the cap. This construction meets the requirements of the SWRR and is proven to exclude almost all of the exterior water from entering the closed disposal cell. This protects the groundwater by reducing the quantity of water infiltration in the disposal areas and leachate generated by the underlying putrescible waste disposal cells, and keeping the wastewater treatment plant from being surcharged to the point where its efficiency and effectiveness in treating the wastewater is reduced. A collection pipe will be installed in the "valley." This pipe will collect the non-contaminated contact water within Cell CD&T-N thereby, reducing the water infiltration into the underlying putrescible waste cells.

All of these features are constructed using procedures to guarantee that the materials used in the

construction, the people and equipment employed to install them, and the installation procedures all combine to provide a final product which at least meets the requirements of the SWRR. These quality assurance and quality control (QA/QC) procedures include:

- the design of the disposal cell by professional engineers who are trained in this work and licensed by the state;
- the permitting of the proposed design and proposed construction by the LDEQ;
- inspection of all environmental construction by qualified inspectors under the direction of a professional engineer with the requisite expertise;
- testing by a laboratory which is LDEQ-accredited;
- inspection by LDEQ inspectors; and,
- the approval of the project construction by the LDEQ after completion and before disposal operations is begun.

These QA/QC procedures protect groundwater by ensuring that the construction procedures and materials utilized in the project are in conformance with the environmental regulations created to protect the groundwater.

The third step in preventing groundwater pollution is monitoring. Upgradient wells provide information about the natural constituents in the groundwater before it reaches the landfill. This information is compared to samples from the downgradient wells, with any discrepancies indicating possible leakage from the disposal cells. The wells are sampled on a semi-annual basis, after the establishment of background, and analyses conducted by a state-accredited environmental laboratory, with the results being submitted to the LDEQ semi-annually. This system protects groundwater by allowing for the detection of any contaminants in the groundwater that may have leaked from waste disposal cells, and causing the immediate implementation of remediation procedures.

Other possible sources of groundwater pollution include the flooding of monitoring wells and the migration of landfill gases through the soil until they come in contact with groundwater. Protections for the groundwater from these sources of pollution include the installation of wells in non-flood areas and the construction and operation of a landfill gas collection and venting system. The first prevents flooding of the wells, and the second employs procedures and equipment that remove landfill gases from disposal cells by venting them to the atmosphere, and monitor the migration of landfill gases through the ground.

All of these features prevent groundwater pollution by containing the fluids and solid waste materials within the disposal cells; preventing groundwater from infiltrating into the disposal cells; minimizing the entry of surface runoff and rainfall into the disposal cells; removing leachate from the Type I/II, disposal cells to the wastewater plant for treatment; monitoring the release of all liquids from the landfill property; monitoring the groundwater for any possible leakage of waste materials from the cell; and, ensuring that the proper construction materials and techniques are used.

SURFACE WATER EFFECTS. Contamination of streams is another possible adverse effect of solid waste disposal. Surface waters may be polluted by the release of leachate or contaminated storm water from disposed wastes, by the direct addition of such wastes to the surface waters, or indirectly by pollution of groundwater which serves as a source for the surface water (discussed above). Contaminated surface water is not as high strength and cannot pollute groundwater as much as leachate, but can cause harmful results. Leachate and contaminated stormwater were uncontrolled and unregulated products of the open dump system utilized for decades in not only DeSoto Parish, but many other locations. The Mundy Landfill was planned, designed, constructed, permitted, and operated to replace and eliminate such dumps. This expansion allows Mundy Landfill to continue to provide protection of the inhabitants of the area.

The liner, closure cap, and leachate collection and removal system discussed above were designed and constructed to control, contain, and separate polluted waters generated by solid waste disposal from non-polluted stormwater or contact water. These features protect surface waters by collecting harmful liquids and conveying them to the wastewater treatment plant for removal of the waste products and conversion of the contaminated water to relatively harmless water which can be safely released to the environment. This new cell, CD&T-N, will not significantly change the surface drainage of the area. Current drainage of the area will be maintained and assisted during filling operations and post closure by the installation of a drainage pipe that will run the length of the valley between the existing cells.

Mundy Landfill monitors surface water at five outfalls or discharge points. All surface runoff *exiting* the landfill does so at one of four "outfalls." Three are along the northern property line and one is at the southeast corner. The fifth outfall discharges from the wastewater treatment plant, thence to one of the outfalls exiting the site. All five outfalls are sampled and monitored according to the Louisiana Pollutant Discharge Elimination System water discharge permit issued to the landfill. This protects surface water by monitoring the waters exiting the site which will enter downstream waterways.

Sedimentation ponds collect runoff, and hold it for a period of time, until eroded soil materials carried by the runoff settle to the bottom of the ponds. The water is then allowed to exit the ponds and the site. Such treatment, while not pertaining directly to solid waste, prevents erosion of the site during construction and disposal operations from resulting in sediment buildup in downstream bodies of water, which could adversely affect wildlife and cause flooding.

Another protection for surface water is a system of controls for surface run-on and run-off. Surface water outside the limits of Cell CD&T-N is prevented from entering the cell (run-on) by a series of earthen berms and drainage ditches which channel the surface flow around and away from the cell. The water is discharged into the sedimentation ponds for removal of the silt. Water collected

These design and construction features prevent surface water pollution by minimizing the entry of surface runoff and rainfall into the disposal cells, controlling contaminated water within the putrescible waste disposal cells, directing silt-laden stormwater runoff and contact water to the

sedimentation ponds for desilting, and monitoring the release of all liquids from the landfill property.

AIR QUALITY EFFECTS. A third potentially harmful effect of solid waste disposal is pollution of the air. This could be caused by release of landfill gas generated by decomposing waste materials, either directly at the site of disposal or indirectly after migration of such gas through subsurface soils. Possible effects of air pollution include threat to human health, noxious odors, and explosions.

This is generally not a problem with the Type III wastes, however, Cell CD&T-N includes features and procedures to control the migration and the release of the gas generated by waste decomposition within the Cell VI. A system of ventilation pipes will be provided at the intersection of the Type I/II and Type III cell. The site for the landfill was selected partly because it is relatively remote, with few residences and businesses close enough to be affected by gases. The cell liner and cap are more impermeable than the wastes they contain, and trap and divert gas to collection systems which release the gas to the atmosphere at specified locations, where they can be tested and monitored. Air currents dissipate vented landfill gas before it becomes a nuisance to neighbors. Monitoring equipment is used by trained operators to ensure that gas concentrations within buildings and at the landfill boundaries, above and below ground, are less than levels stipulated in the SWRR, preventing explosions and migration outside the landfill limits. A landfill gas monitoring plan in Appendix C of the Permit Renewal Application details procedures and protocols to be employed by landfill personnel.

The inert nature of the Type III wastes, the location of the facility, the passive landfill gas venting system, and the gas monitoring system prevent any harmful effects from air pollution. The types of wastes permitted for disposal, and the relatively small volume disposed daily result in the generation of quantities of landfill gas which are not harmful and can be handled by the gas system.

VISUAL EFFECTS. Without proper operation, solid waste disposal can quickly become unsightly, due to uncovered wastes, blown paper, waste hauling traffic, dust, exposure of wastes and operation to local traffic, etc. People living in the vicinity or using roadways passing landfills may be exposed to such eyesores. While it is not possible to totally eliminate such problems, the location, construction, and operation of Cell CD&T-N minimizes such adverse effects as much as possible. The landfill is located in a rural, unpopulated area. Closed disposal cells, which will screen the active areas from the highway, surround Cell CD&T-N on all sides. Additional screening is provided by the planting of vegetation along the southern property line.

Operational procedures also prevent adverse visual effects and are part of the landfill permit. Disposed CD&T wastes must be covered at the end of each month with earthen cover, being covered with a minimum of 12 inches of soil. Permanent closure requires construction of a cap consisting of a minimum of two feet of clay which must meet the materials and installation specifications of the compacted clay cell liner.

Litter fences are used around active disposal areas to prevent the escape of litter. Landfill personnel inspect and police the landfill on a regular basis to pick up litter and identify and repair any areas of temporary or permanent closure caps from which unsightly materials might escape. Dust is controlled by moistening dust source areas during times of no rainfall.

These features, construction measures, and operational procedures prevent adverse visual effects around Cell CD&T-N.

NOISE REDUCTION. Similar to adverse visual effects, noise can offset the benefits that a landfill provides to a community. Waste hauling traffic, landfill operational equipment, birds, and other sources can generate a significant amount of noise which would affect local residents. Noise is reduced by screening active disposal cells with surrounding features which are higher and contain the noise, and by the siting of the landfill in a remote area. Also, the operational hours limit disposal operations to those times which would cause the least disturbance to local residents. These many factors keep noise from disturbing any local residents and the landfill from becoming a nuisance.

VECTORS. Although this is not an issue specific to Type III wastes, landfills are generally recognized as sources of food and shelter for disease-causing animals, such as birds, insects, and rodents. These wild animals are called vectors and can carry diseases which are harmful to people and other animals. Even healthy animals, wild or tame, can be harmful to local traffic, nuisances to nearby residents, and problems for agriculture. The SWRR require the control and elimination of vectors by such methods as daily cover (sanitary landfills), interim cover, and final covers for disposed wastes, use of approved pesticides, control of wastes within disposal cells, daily site inspections, and other procedures. The Mundy Landfill observes and practices all approved methods for controlling vectors with procedures which are detailed in the Permit Renewal Application. These procedures have historically prevented vectors from being a problem at this facility and this is expected to continue with the expansion. The Type III wastes of Cell CD&T-N will not contribute significantly to this problem.

DEVELOPMENT. As described above, the Mundy Landfill is located in a rural, unpopulated area of DeSoto Parish. There are no master, zoning, or development plans for the area, existing or anticipated. The few neighbors around the landfill have never objected to its presence and operation. This lack of development prevents the landfill from being a nuisance.

Public hearings were conducted when the landfill was being planned, and the public endorsed the plan. All permit modifications over the subsequent 21 years have required advertisement and public viewing periods, with no objections being voiced. The public will be informed of this modification request and given an opportunity to view the proposal and voice any objections. The DPPJ and its Solid Waste Committee meet at least monthly in public forums, to which residents are allowed to express concerns or problems, and none have done so. The landfill is sufficiently distant from its neighbors and operated in such a way that there have been no complaints directed to the DPPJ.

REAL ADVERSE EFFECTS. There are few real adverse effects that have resulted from the operation of the Mundy Landfill, those being the occasional unavoidable problems which are inherent to solid waste disposal, and which are more nuisances than real problems. Significant adverse effects, such as air, water, and groundwater pollution, are unknown at this facility, having been prevented by its planning, siting, design, construction, permitting, and operation. The lesser nuisances like occasional traffic, dust, noise, and visual problems are heavily outweighed by the serious adverse effects which existed before the landfill was built. This facility was conceived to improve the previous solid waste management system in DeSoto Parish, which consisted of open dumps and littering. During its history, the landfill has fulfilled its purpose of providing the residents of the parish with an environmentally safe location and method for disposing of solid wastes. This CD&T-N expansion will allow Mundy Landfill the opportunity to continue these beneficial services for the residents of DeSoto Parish by providing disposal area for non-putrescible wastes and allowing valuable compositely lined cells to be filled with only residential and industrial sanitary wastes.

CONCLUSION. Modification No.2 demonstrates that the permitting, construction, and operation of Cell CD&T-N meets or exceeds all of the current regulations and technology for Type III landfill construction. The adverse effects described above are mitigated or eliminated by Mundy Landfill operation and design, and the multitude of much more serious consequences of open dump disposal and dumping of waste materials along the roads or in the forests, as practiced before the landfill was built, are prevented. The Mundy Landfill has a history and tradition of providing safe, economical, and efficient disposal of solid wastes for the citizens of DeSoto Parish. The continued use of this facility will provide improved protection to the public health and the environment of DeSoto Parish, Louisiana.

Demonstrate using a cost-benefit analysis that the social and economic benefits of the facility outweigh the environmental-impact costs.

The previous section illustrates that the many possible adverse impacts from the implementation of Cell CD&T-N and its integration within the Type I/II cells are mitigated or eliminated by the measures and procedures used in its design, permitting, construction, and operation. The lack of potential and real environmental costs for the proposed project makes it a simple matter to demonstrate that the costs are outweighed by its benefits.

The implementation of Cell CD&T-N will continue its disposal services and operations for Type III wastes and continue the following benefits to the residents of DeSoto Parish:

SOLID WASTE DISPOSAL. The Solid Waste Department (SWD) of DeSoto Parish is funded by two sources: taxes and landfill revenues. This allows for parish solid waste disposal without having to charge parish residents fees for this service. Failure to construct the new non-putrescible waste disposal cell would prematurely exhaust one of these revenue sources by requiring CD&T waste to be disposed in an expensive compositely lined cell. If the landfill airspace were deleted, it would force the SWD to truck the parish's solid wastes increased

distances, at significant cost, to other facilities for disposal. Loss of a revenue source could impact operational costs with a substantial reduction in revenues. Making up the difference could require an increase in taxes or an assessment of monthly fees for solid waste collection. The low- to middle-income class of citizen living in DeSoto Parish would find it very difficult to accommodate such additional costs. Maintaining services by constructing and permitting CD&T-N will continue the beneficial service to parish residents without increasing the costs by extending the life of the facility's Type III and Type I/II disposal cells.

REDUCED TAXATION. The DeSoto Parish Police Jury has been working to increase the waste stream into the landfill by soliciting new customers. Increases in the waste stream translate into increased revenues for the Solid Waste Department. Such increased revenues may allow the reduction in taxes which help fund solid waste collection and disposal operations in the parish, or possibly the use of the existing taxes to improve funding for other parish services, such as road maintenance. Either option could not fail to improve the quality of life for parish residents. Failure to proceed with the CD&T-N hinders the flexibility and diversity of the services offered by the Mundy facility and fragments environmental efforts. It would result in an increased cost of living as described in the previous section by prevention of the potential improved quality of life that would ensue from a reduction in taxes or improvement in other parish services.

EMPLOYMENT. The Solid Waste Department employs many parish residents for its collection and disposal operations. This was one of the deciding factors in the decision by the DeSoto Parish Police Jury in 1984 to permit and construct Mundy Landfill and get into the solid waste disposal business. Failure to proceed with Cell CD&T-N would result in a premature depletion of the facility's airspace and therefore, a reduction in labor needs with a number of parish residents losing their jobs. Continuing of this disposal service (Type III) would also prevent the reduction in unemployment in the parish. The DeSoto Parish Police Jury hopes to increase the waste stream in to Mundy Landfill. This increased waste stream will require the hiring of additional employees by the SWD to handle the increased work.

ENVIRONMENTAL BENEFITS. Before the construction of Mundy Landfill, DeSoto Parish had major problems with open dumps, the littering of its roads and properties with wastes, and potential pollution of the air, groundwater, etc. The landfill has eliminated much of this problem. The potential adverse effects of not building Cell CD&T-N, increased solid waste collection/disposal fees, increased taxes, increased unemployment - might possibly be accompanied by a return to the methods of waste disposal before the landfill was built - littering and open dumps for those waste services not offered. Proceeding with the new disposal cell will enable the parish government to continue its efforts to clean up the parish and prevent environmental damage from illegal solid waste disposal.

CONCLUSION: The above discussion clearly illustrates that the benefits of constructing and operating Cell CD&T-N outweigh the potential costs of the project. The benefits are definite - the costs are possible and are either mitigated or eliminated by design, construction, permitting, inspection, and operation procedures which are in conformance with the Solid Waste Rules and Regulations and the landfill permit.

Discuss possible alternative projects which would offer more protection to the environment without unduly curtailing nonenvironmental benefits.

There are no possible alternative projects which would offer more protection to the environment without curtailing non-environmental benefits. Cell CD&T-N must be permitted and constructed on a schedule, to prevent interruption of waste disposal activities and the possibility of the problems described in the previous section. Cell CD&T-S is close to exhaustion of its available space, and disposal operations must be relocated to the currently active Type I/II cell if the facility is to provide services for these wastes. The only available space at the permitted landfill for new disposal cells are the areas reserved for Cell VI, Phase 4 and Cell VII, Phase 2.

Cell VI, Phase 4, now designated as CD&T-N, is designed as a CD&T area. Cell CD&T-N is proposed for constructed in the "valley" between Cell VI, Phases 1 - 3 and closed Cells I - III. Cell VII, Phase 2 is a small area of the existing landfill between Cell VII, Phase I and Cell V. Design, permitting and construction of this area would not be a wise use of Police Jury funds. The cost would be significant while the airspace would not.

The Cell CD&T design provides the facility with airspace to accommodate their growing incoming waste streams. With the approval of Modification No. 2, Mundy Landfill will be able to ensure continued Type III disposal operations for many years. Thereby reducing costs to the Police Jury and hence the tax paying citizens by not requiring Type III wastes to be placed in a Type I/II cell. It would not be prudent to use valuable airspace permitted for Type I/II wastes for the disposal of Type III wastes. Cell VII is sited west of Cells I - IV and is currently an active disposal area.

There is not a better location available within the property for the construction of another CD&T disposal cell, so the only other alternative is to cease disposal of these kinds of wastes at the landfill or dispose of these wastes in a Type I/II cell. Using Type I/II cells for the disposal of Type III waste is not a prudent use of taxpayer funds. Exhaustion of the Type I/II cells would require the facility to close. As described in a previous section, discontinuing this service could lead to elimination of some parish employees. It would end the free disposal of waste at the landfill by parish residents. It would require the trucking of solid waste from DeSoto Parish to other disposal facilities, increasing the costs of solid waste disposal in the parish while eliminating a major source of solid waste revenue (the landfill). Such increased costs and reduced revenues would require increased taxation. Closure would also result in the resumption of illegal dumping of wastes along the roadways and in the forests of the parish.

CONCLUSION: Cell CD&T-N meets all current regulations and state of the art construction techniques for Type III solid waste disposal. The alternatives to not building the new cell are unreasonable, fragment the services provided by the facility and could result in considerable environmental, economic, and political damage to the residents of DeSoto Parish.

Discuss possible alternative sites which would offer more protection to the environment

without unduly curtailing nonenvironmental benefits.

A traditional alternative site analysis is not required because of the existence of a landfill in DeSoto Parish permitted for the disposal of sanitary and CD&T wastes. Mundy Landfill was permitted and constructed in 1986 to provide for the solid waste disposal needs of DeSoto Parish, to allow the closures of all open dumps, and to prevent the illegal dumping of wastes along the roads and in the forests of the parish. Since its construction, it has been constantly expanded and improved to continue to provide these services. The DeSoto Parish Police Jury is attempting to maximize the service life of this facility, and the construction and operation of CD&T-N Cell is the next logical step in the development of the landfill.

The only two options to building CD&T-N Cell are: the permitting and construction of another Type III facility in the parish; or, the disposal of solid waste at another facility outside the parish. Because of the extensive requirements in the Solid Waste Rules and Regulations concerning landfills, which provide for the protection of the public health and environment, the need for permitting and construction of a new facility for these wastes is not justified.

Trucking parish solid waste materials to another facility outside the parish is discussed in previous sections. The economic, political, and environmental ramifications of limiting the services offered at the Mundy Landfill, rather than implementing the development of a new disposal cell which meets all current regulations, would cause major problems for the residents and government of DeSoto Parish.

CONCLUSION: Mundy Landfill was conceived, planned, designed, and permitted to provide for the safe, efficient, and convenient disposal of solid waste in DeSoto Parish and surrounding areas. Failure to proceed with the development and utilization of the facility in accordance with its permitted purpose and with all pertinent environmental guidelines should not even be considered. The services offered and the life of the landfill should be maximized to continue its history of service to the residents of DeSoto Parish.

Discuss and describe mitigating measures which would offer more protection to the environment than the facility, as proposed, without unduly curtailing nonenvironmental benefits.

There are no mitigating measures that would offer more protection than those described in Permit Modification No. 2, concerning the design, permitting, and construction of Cell CD&T-N, without curtailing non-environmental benefits. This project includes design, construction, and inspection procedures that meet or exceed all current requirements of the LDEQ, the Solid Waste Rules and Regulations, and the landfill permit, and that are proven to be environmentally sound and effective. The design and permit modification are prepared by professional engineers licensed by the state of Louisiana. The design and permit modification application must be reviewed and approved by LDEQ staff, who will also inspect the project during and after construction, and then review and approve the construction certification. Construction inspectors must be certified by LDEQ and perform inspection, sampling, and testing according to national

guidelines and procedures. The proposed disposal cell is sited in an area to maximize its service life and minimize environmental problems. All of these measures provide quality assurance and quality control that ensure protection of the public health and the environment.

CONCLUSION: Cell CD&T-N meets all current regulations, requirements, and state of the art design and construction techniques for Type III solid waste disposal. There are no mitigating measures that would improve the proposed project for the Mundy Landfill.

ATTACHMENT D

NEW APPENDIX T

TO THE PERMIT RENEWAL APPLICATION

APPENDIX T: CELL CD&T-N

T-1 ENGINEERING CALCULATIONS

- T-1a** Volumetric and Surface Area Estimates
- T-1b** Slope Stability Analyses
- T-1c** Settlement Analysis
- T-1d** Soil Loss Calculations
- T-1e** Pipe Size/Deflection

T-2 2006 PERMIT DRAWINGS

- STE-T1** Bottom of Cell
- STE-T2** Conceptual Bottom of Final Cover Contours
- STE-T3** Conceptual Cross-Section: Station N92+50
- STE-T4** Details

*Mundy Landfill
Modification No. 2*

APPENDIX T-1

ENGINEERING CALCULATIONS

- T-1a** Volumetric and Surface Area Estimates
- T-1b** Slope Stability Analyses
- T-1c** Settlement Analysis
- T-1d** Soil Loss Calculations
- T-1e** Pipe Size/Deflection

*Mundy Landfill
Modification No. 2*

APPENDIX T-1a

Volumetric and Surface Area Estimates

DATE	KLM
TIME	2/21/06

C & D Valley Cell

Volume using end areas

$$\begin{aligned}
 Vol &= \left(\frac{1}{2}\right)(1059)(45) + \left(\frac{1059+9571}{2}\right)(100) + \left(\frac{9571+27145}{2}\right)(100) + \left(\frac{27145+45856.5}{2}\right)(100) \\
 &\quad + \left(\frac{45856.5+18819.45}{2}\right)(100) + \left(\frac{18819.45+5644}{2}\right)(100) + \left(\frac{5644+1197.9}{2}\right)(100) \\
 &\quad + \left(\frac{1}{2}\right)(1197.9)(20) \\
 &= 23827.5 + 531500 + 1835800 + 3650075 + 3233797.5 + 1223172.5 \\
 &\quad + 34209.5 + 11979 \\
 &= 10,544,361 \text{ ft}^3 = \underline{\underline{390,532 \text{ Cyd}}}
 \end{aligned}$$

Tonnage:

$$\text{Gross Vol} = 390,532 \text{ Cy}$$

$$V_{\text{NET}} = (0.85)(390,532) = 331,952.2 \text{ Cy}$$

$$\begin{aligned}
 @ 55 \text{ pcf} \\
 W &= \frac{331,952.2 \text{ Cy} \times 27 \frac{\text{ft}^3}{\text{Cy}} \times 55 \frac{\text{lb}}{\text{ft}^3}}{2000 \text{ lb/ton}} \\
 &= \underline{\underline{246,475 \text{ tons}}}
 \end{aligned}$$

PREPARED BY	KLM
DATE	2/21/06

X-SECT AREAS (Coordinate method)

E104+00

$$\frac{100}{206.95} \times \frac{200}{230} \times \frac{300}{246} \times \frac{310}{246} \times \frac{300}{244.22} \times \frac{200}{220.37} \times \frac{100}{206.95}$$

$$2A = [(100)(230) + (200)(246) + (300)(246) + (310)(244.2) + (300)(220.4) + (200)(206.95)] \\ - [(206.95)(200) + (230)(300) + (246)(310) + (246)(300) + (244.2)(200) + (220.4)(100)]$$

$$2A = 329212 - 33130 = 2118$$

$$A = 1059 \text{ ft}^2$$

E105+00

$$\frac{100}{206.92} \times \frac{200}{236} \times \frac{300}{265} \times \frac{400}{279} \times \frac{500}{279} \times \frac{600}{279} \times \frac{500}{270.22} \times \frac{400}{247.91} \times \frac{300}{223.35} \times \frac{200}{221.66} \times \frac{100}{206.92}$$

$$2A = [(100)(236) + (200)(265) + (300)(279) + (400)(279) + (500)(279) + (600)(270.27) \\ + (500)(247.91) + (400)(223.35) + (300)(221.66) + (200)(206.92)] \\ - [(206.92)(200) + (236)(300) + (265)(400) + (279)(500) + (279)(600) + (279)(500) \\ + (270.22)(400) + (247.91)(300) + (223.35)(200) + (221.66)(100)]$$

$$2A = 894739 - 913881 = 19142$$

$$A = 9,571 \text{ ft}^2$$

E106+00

$$\frac{25}{255} \times \frac{100}{272.5} \times \frac{200}{294} \times \frac{300}{311} \times \frac{400}{311} \times \frac{500}{311} \times \frac{600}{311} \times \frac{670}{300} \times \frac{600}{279.79} \times \frac{500}{258.13} \times \frac{400}{252.53} \times \frac{300}{246.95} \times \frac{200}{237.40} \\ \times \frac{200}{237.40} \times \frac{100}{257.72} \times \frac{25}{255}$$

$$2A = [(25)(272.5) + (100)(294) + (200)(311) + (300)(311) + (400)(311) + (500)(311) + (600)(300) + (670)(279 \\ + (600)(258.13) + (500)(252.53) + (400)(246.95) + (300)(237.4) + (200)(237.4) \\ + (100)(255)] \\ - [(255)(100) + (272.5)(200) + (294)(300) + (311)(400) + (311)(500) + (311)(600) + (311)(670) \\ + (300)(600) + (279.79)(500) + (258.13)(400) + (252.53)(300) + (246.95)(200) \\ + (237.40)(100) + (257.72)(25)]$$

$$2A = 1367258.8 - 1421549 = 54290.2$$

$$A = 27145 \text{ ft}^2$$

DATE	KLM
TIME	2/21/06

X-SECT AREAS (Coordinate method)

E107+00

$$\frac{93}{280} \times \frac{100}{282} \rightarrow \frac{200}{305} \times \frac{290}{330} \times \frac{400}{330} \times \frac{500}{330} \times \frac{600}{330} \times \frac{700}{300} \times \frac{600}{261.08} \times \frac{500}{258.26} \times \frac{400}{254.1} \times \frac{300}{252.28}$$

$$\frac{300}{252.28} \times \frac{200}{271.12} \times \frac{100}{279} \times \frac{93}{279}$$

$$2A = [(93)(282) + (100)(305) + (200)(330) + (290)(330) + (400)(330) + (500)(330) + (600)(300) \\ + (700)(261.08) + (600)(258.26) + (500)(254.1) + (400)(252.28) + (300)(271.12) \\ + (200)(279) + (100)(279)] \\ - [(280)(100) + (305)(290) + (330)(400) + (330)(500) + (330)(600) + (330)(700) + (300)(600) \\ + (261.08)(500) + (258.26)(400) + (254.1)(400) + (252.28)(200) + (271.12)(100) + (279)(93) \\ + (282)(200)]$$

$$2A = 1426136 - 1517849 = 91713$$

$$A = 45856.5 \text{ ft}^2$$

E108+00

$$\frac{36}{290} \times \frac{55}{295} \times \frac{100}{306} \times \frac{200}{323} \times \frac{300}{324} \times \frac{400}{324} \times \frac{500}{324} \times \frac{605}{300} \times \frac{500}{261.26} \times \frac{400}{271.76} \times \frac{300}{290.27} \times \frac{200}{293.47} \times \frac{100}{295.84} \times \frac{30}{290}$$

$$2A = [(30)(295) + (55)(306) + (100)(323) + (200)(324) + (300)(324) + (400)(324) + (500)(300) \\ + (605)(261.26) + (500)(271.76) + (400)(290.27) + (300)(293.47) + (200)(295.84) + (100)(290)] \\ - [(290)(55) + (295)(100) + (306)(200) + (323)(300) + (324)(400) + (324)(500) + (324)(605) \\ + (300)(500) + (261.26)(400) + (271.76)(300) + (290.27)(200) + (293.47)(100) + (295.84)(30)]$$

$$2A = 1085839.3 - 1123478.2 = 37638.9$$

$$A = 18819.45 \text{ ft}^2$$

PREPARED BY	KLM
DATE	2/21/06

X-SECT (Coordinate)

E109+00

$$\frac{100}{294.5L} \times \frac{200}{294} \times \frac{300}{294} \times \frac{400}{294} \times \frac{510}{294} \times \frac{500}{291.09} \times \frac{400}{268.51} \times \frac{300}{270.0} \times \frac{200}{288.65} \times \frac{100}{294.5L}$$

$$\begin{aligned} 2A = & [(100)(294) + (200)(294) + (300)(294) + (400)(294) + (510)(291.09) + (500)(268.51) \\ & + (400)(270) + (300)(288.65) + (200)(294.5L)] \\ & - [(294.5L)(200) + (294)(300) + (294)(400) + (294)(510) + (294)(500) + (291.09)(400) \\ & + (268.51)(300) + (270)(200) + (288.65)(100)] \end{aligned}$$

$$2A = 830217.9 - 841506 = 11288.1$$

$$A = 5644 \text{ ft}^2$$

E110+00

$$\frac{100}{266.66} \times \frac{200}{267} \times \frac{315}{267} \times \frac{300}{265.28} \times \frac{200}{256.01} \times \frac{100}{266.66}$$

$$\begin{aligned} 2A = & [(100)(267) + (200)(267) + (315)(265.28) + (300)(256.01) + (200)(266.66)] \\ & - [(266.66)(200) + (267)(315) + (267)(300) + (265.28)(200) + (256.01)(100)] \end{aligned}$$

$$2A = 293798.2 - 296194 = 2395.8$$

$$A = 1197.9 \text{ ft}^2$$

VOLUME OF WASTE FILL (ave end)

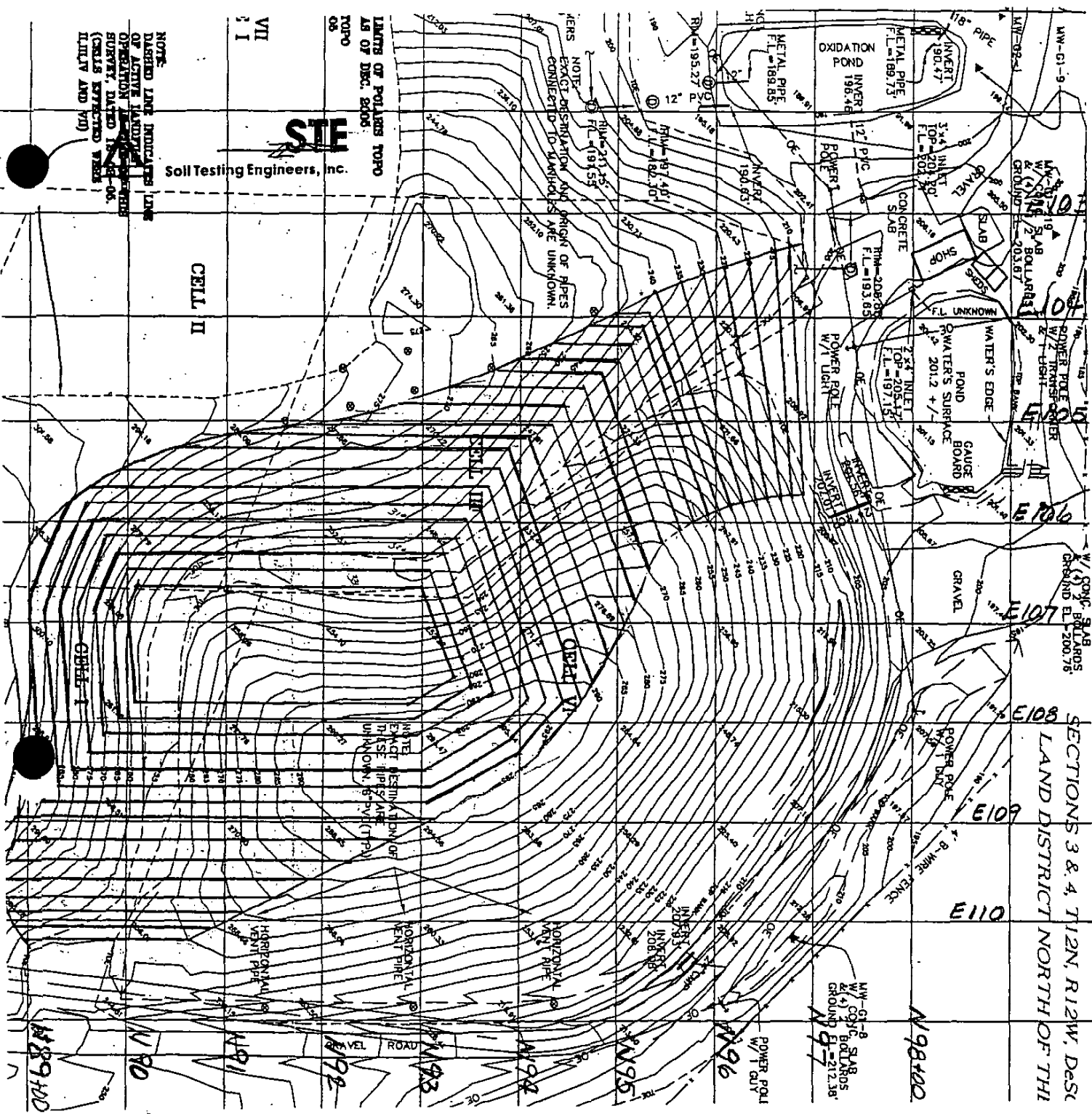
$$\begin{aligned} Vol = & (\frac{1}{2})(1059)(45') + (\frac{1059+9571}{2})(100) + (\frac{9571+27145}{2})(100) \\ & + (\frac{27145+45856.5}{2})(100) + (\frac{45856.5+18819.45}{2})(100) \\ & + (\frac{18819.45+5644}{2})(100) + (\frac{5644+1197.9}{2})(100) \\ & + (\frac{1}{2})(1197.9)(20) \end{aligned}$$

$$= 23827.5 + 531500 + 1835800 + 3650075 + 3233797.5$$

$$+ 1223172.5 + 34209.5 + 11979$$

$$= 10,544,361 \text{ ft}^3 = 390,532 \text{ CY}$$

BEST COPY



Mundy CD&T Cell
Cost Estimates

5/24/06
KLM

SOIL QUANTITIES:

Area Covered by C/D&T Cell :

$$\left(\frac{170+215}{2}\right)(20) = 3850 \text{ Ft}^2$$

$$\left(\frac{215+420}{2}\right)(100) = 31750$$

$$\left(\frac{420+550}{2}\right)(100) = 48500$$

$$\left(\frac{550+610}{2}\right)(100) = 58000$$

$$\left(\frac{610+660}{2}\right)(100) = 63500$$

$$\left(\frac{660+720}{2}\right)(30) = 20700$$

$$\left(\frac{720+485}{2}\right)(70) = 42175$$

$$\left(\frac{485+185}{2}\right)(100) = 33500$$

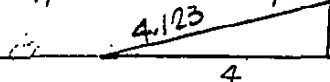
$$\left(\frac{1}{2}\right)(185)(70) = 6475$$

$$308,450 \text{ Ft}^2 = 7.08 \text{ ac}$$

3-D Effect

Approx. side slopes $\approx 1:4$

$$3D \text{ Effect} = 4.123/4.0 = 1.03$$



$$\text{For } 1:3 \quad 3D \text{ Effect} = \frac{1.10}{3} = \frac{3.162}{3} = 1.05$$

PORTION of C/D&T Cell covering Cell VI :

$$\left(\frac{1}{2}\right)(185)(100) = 9250 \text{ Ft}^2$$

$$\left(\frac{160+185}{2}\right)(75) = 12938$$

$$\left(\frac{225+145}{2}\right)(25) = 4625$$

$$\left(\frac{145+195}{2}\right)(65) = 11050$$

$$\left(\frac{440+445}{2}\right)(35) = 15488$$

$$\left(\frac{445+395}{2}\right)(100) = 42000$$

$$\left(\frac{395+285}{2}\right)(100) = 34000$$

$$\left(\frac{285+100}{2}\right)(100) = 19250$$

$$\left(\frac{100+70}{2}\right)(20) = 1700$$

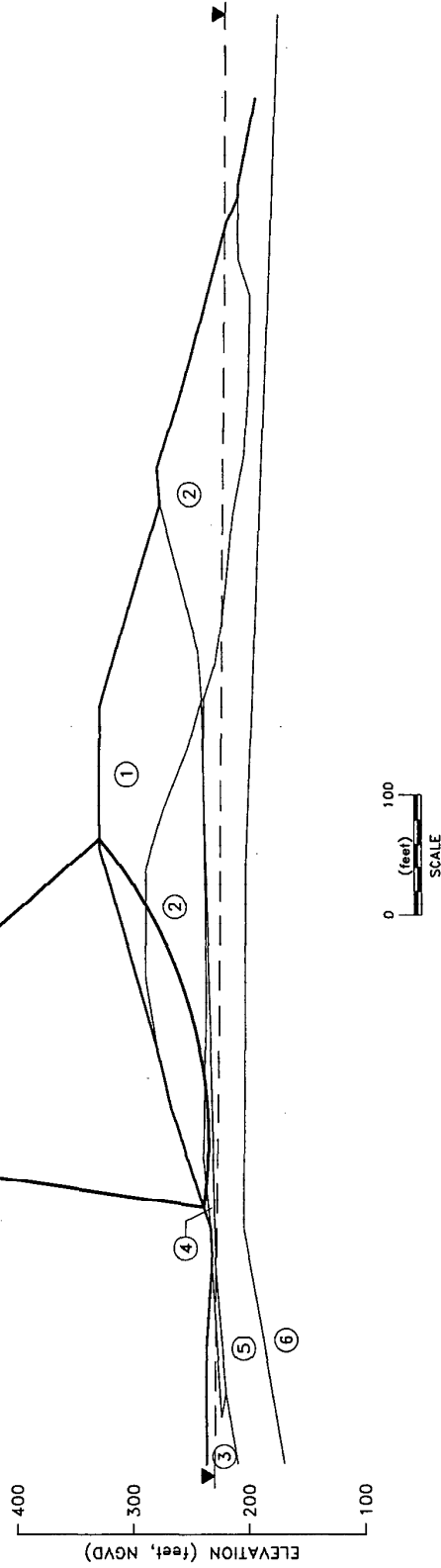
$$150,301 \text{ Ft}^2 = 3.45 \text{ ac}$$

*Mundy Landfill
Modification No. 2*

APPENDIX T-1b

Slope Stability Analyses

F.S. = 2.0



SOIL PARAMETERS				
LAYER NO.	DESCRIPTION	UNIT WEIGHT (pcf)	SHEAR STRENGTH (psf)	FRICTION ANGLE (degrees)
1	C & D	65	0	26
2	MSW	63	300	23
3	ZONE B	120	1500	0
4	ZONE C	120	0	26
5	ZONE D1	120	2000	0
6	ZONE D2	120	3500	0

MUNDY SANITARY LANDFILL	
DE SOTO PARISH, LOUISIANA	
for	
DE SOTO PARISH POLICE JURY	
MANSFIELD, LOUISIANA	
JONES ENVIRONMENTAL, INC.	
SHREVEPORT, LOUISIANA	
STE	
Soil Testing Engineers, Inc.	
Baton Rouge, LA Jefferson, LA Bossier, MS	
Project Engineer:	Drawn by:
K. McNamara	DMS
File No.:	Date:
05-1157	5-11-06
Title:	Figure No.:
SLOPE STABILITY ANALYSIS	
1	

F.S. = 2.103

XSTABL File: MUNDY91C 4-20-06 10:37

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*****
*               X S T A B L               *
*               Slope Stability Analysis    *
*               using the                   *
*               Method of Slices           *
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*               Interactive Software Designs, Inc. *
*               Moscow, ID 83843, U.S.A.    *
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*****

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Problem Description : Mundy Landfill Sta. N91+00

 SEGMENT BOUNDARY COORDINATES

14 SURFACE boundary segments

Unit	Segment	x-left	y-left	x-right	y-right	Soil
Segment	No.	(ft)	(ft)	(ft)	(ft)	Below
	1	.0	240.0	100.0	245.3	3
	2	100.0	245.3	130.0	245.0	3
	3	130.0	245.0	200.0	238.9	3
	4	200.0	238.9	265.0	260.0	2
	5	265.0	260.0	300.0	266.7	2
	6	300.0	266.7	525.0	330.0	1
	7	525.0	330.0	635.0	330.0	1
	8	635.0	330.0	800.0	289.0	1
	9	800.0	289.0	900.0	255.0	2
	10	900.0	255.0	950.0	240.0	2
	11	950.0	240.0	1020.0	220.0	2
	12	1020.0	220.0	1040.0	210.0	2
	13	1040.0	210.0	1060.0	210.0	2
	14	1060.0	210.0	1100.0	200.0	2

29 SUBSURFACE boundary segments

Unit	Segment	x-left	y-left	x-right	y-right	Soil
Segment	No.	(ft)	(ft)	(ft)	(ft)	Below

1	300.0	266.7	350.0	270.0	2
2	350.0	270.0	400.0	270.0	2
3	400.0	270.0	500.0	271.8	2
4	500.0	271.8	530.0	270.0	2
5	530.0	270.0	600.0	258.3	2
6	600.0	258.3	650.0	247.0	2
7	650.0	247.0	700.0	258.1	2
8	700.0	258.1	750.0	276.0	2
9	750.0	276.0	800.0	289.0	2
10	.0	227.0	200.0	238.9	4
11	200.0	238.9	220.0	230.0	4
12	220.0	230.0	380.0	232.0	4
13	380.0	232.0	535.0	230.0	4
14	535.0	230.0	650.0	247.0	6
15	650.0	247.0	651.0	240.0	6
16	651.0	240.0	670.0	230.0	6
17	.0	227.0	200.0	220.0	5
18	200.0	220.0	535.0	230.0	5
19	535.0	230.0	670.0	230.0	5
20	670.0	230.0	700.0	225.0	5
21	700.0	225.0	740.0	220.0	5
22	740.0	220.0	790.0	215.0	5
23	790.0	215.0	810.0	210.0	5
24	810.0	210.0	840.0	205.0	5
25	840.0	205.0	900.0	200.0	5
26	900.0	200.0	1000.0	210.0	5
27	1000.0	210.0	1010.0	210.0	5
28	1010.0	210.0	1100.0	195.0	5
29	.0	170.0	1100.0	170.0	7

ISOTROPIC Soil Parameters

7 Soil unit(s) specified

Water Surface No.	Soil	Unit Weight		Cohesion	Friction	Pore Pressure	
	Unit	Moist	Sat.	Intercept	Angle	Parameter	Constant
	No.	(pcf)	(pcf)	(psf)	(deg)	Ru	(psf)
1	1	65.0	65.0	.0	26.00	.000	.0
1	2	63.0	63.0	300.0	23.00	.000	.0
1	3	120.0	120.0	1500.0	.00	.000	.0
1	4	120.0	120.0	.0	26.00	.000	.0
1	5	120.0	120.0	2000.0	.00	.000	.0
1	6	120.0	120.0	1000.0	.00	.000	.0

1

7 120.0 120.0 3500.0 .00 .000 .0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	234.00
2	1100.00	227.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

2500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 50 points equally spaced along the ground surface between x = .0 ft
and x = 300.0 ft

Each surface terminates between x = 400.0 ft
and x = 750.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
 Upper angular limit := -5.0 degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface
 is specified by 29 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	195.92	239.26
2	212.10	227.50
3	228.97	216.75
4	246.45	207.04
5	264.49	198.41
6	283.02	190.89
7	301.97	184.50
8	321.28	179.27
9	340.87	175.22
10	360.66	172.37
11	380.59	170.72
12	400.59	170.28
13	420.57	171.05
14	440.47	173.03
15	460.22	176.21
16	479.74	180.59
17	498.95	186.13
18	517.79	192.84
19	536.20	200.67
20	554.09	209.60
21	571.41	219.60
22	588.10	230.63
23	604.08	242.65
24	619.31	255.61
25	633.72	269.48
26	647.27	284.19
27	659.90	299.70
28	671.57	315.94
29	674.28	320.24

**** Simplified BISHOP FOS = 2.103 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Mundy Landfill Sta. N91+00

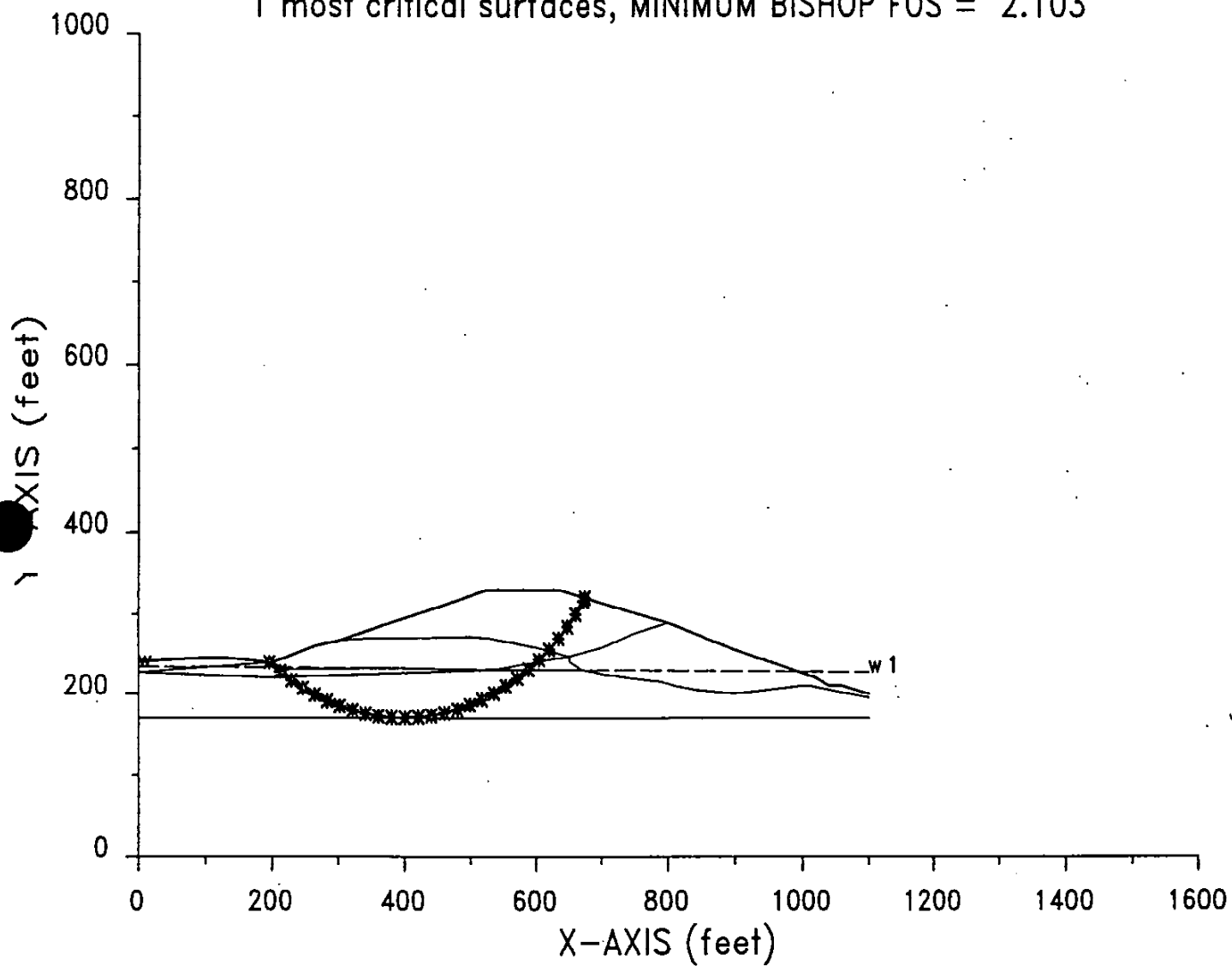
Resisting		FOS	Circle Center		Radius	Initial	Terminal
Moment		(BISHOP)	x-coord	y-coord		x-coord	x-coord
(ft-lb)			(ft)	(ft)	(ft)	(ft)	(ft)
3.119E+08	1.	2.103	397.85	500.27	330.00	195.92	674.28
2.293E+08	2.	2.126	377.96	439.13	266.04	202.04	620.50
2.872E+08	3.	2.127	375.94	484.31	310.64	183.67	644.05
1.618E+08	4.	2.134	297.51	602.90	375.67	202.04	555.65
2.442E+08	5.	2.136	369.50	450.98	277.30	189.80	618.86
1.609E+08	6.	2.139	286.25	618.37	390.68	189.80	549.65
3.284E+08	7.	2.144	407.48	519.44	347.18	202.04	689.05
2.145E+08	8.	2.147	371.26	432.66	256.76	202.04	606.52
2.281E+08	9.	2.147	364.62	438.92	264.99	189.80	606.03
1.534E+08	10.	2.152	282.27	601.70	375.73	177.55	541.61

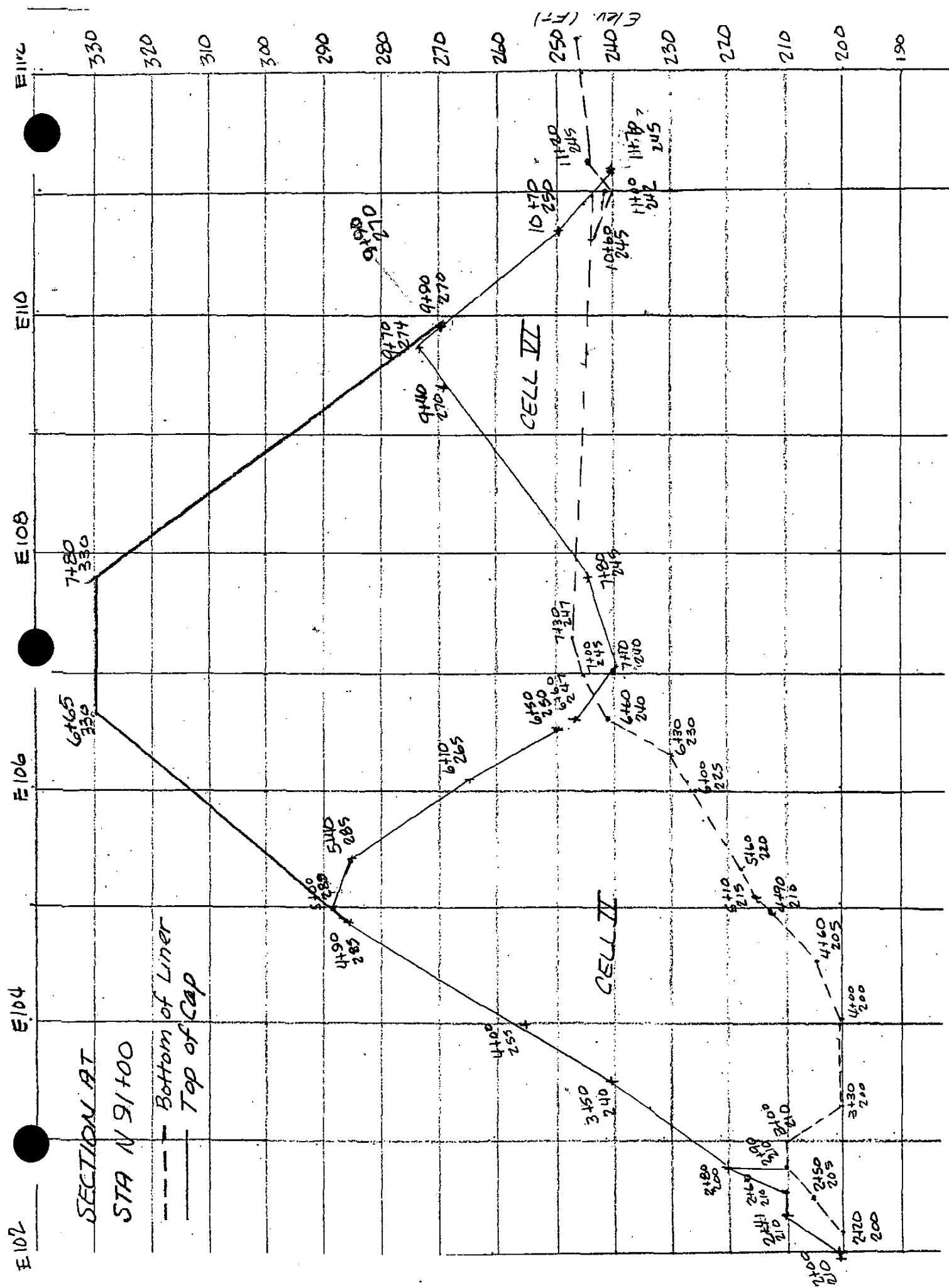
* * * END OF FILE * * *

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Mundy Landfill Sta. N91+00

1 most critical surfaces, MINIMUM BISHOP FOS = 2.103





F.S. = 2.091

XSTABL File: MUNDY92B 4-20-06 10:49

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*****
*               X S T A B L               *
*               Slope Stability Analysis   *
*               using the                   *
*               Method of Slices           *
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*               Moscow, ID 83843, U.S.A.    *
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*****

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Problem Description : Mundy Landfill Station N92+00

 SEGMENT BOUNDARY COORDINATES

14 SURFACE boundary segments

Unit	Segment	x-left	y-left	x-right	y-right	Soil
	No.	(ft)	(ft)	(ft)	(ft)	Below
Segment						
	1	.0	237.0	100.0	237.0	3
	2	100.0	237.0	170.0	232.0	3
	3	170.0	232.0	200.0	233.5	4
	4	200.0	233.5	300.0	268.0	2
	5	300.0	268.0	350.0	280.0	2
	6	350.0	280.0	520.0	330.0	1
	7	520.0	330.0	635.0	330.0	1
	8	635.0	330.0	800.0	277.7	1
	9	800.0	277.7	830.0	280.0	2
	10	830.0	280.0	890.0	260.0	2
	11	890.0	260.0	1030.0	220.0	2
	12	1030.0	220.0	1050.0	210.0	2
	13	1050.0	210.0	1060.0	210.0	5
	14	1060.0	210.0	1130.0	195.0	5

42 SUBSURFACE boundary segments

Unit	Segment	x-left	y-left	x-right	y-right	Soil
	No.	(ft)	(ft)	(ft)	(ft)	Below
Segment						

1	350.0	280.0	400.0	288.6	2
2	400.0	288.6	410.0	290.0	2
3	410.0	290.0	500.0	290.3	2
4	500.0	290.3	520.0	285.0	2
5	520.0	285.0	550.0	275.0	2
6	550.0	275.0	600.0	254.1	2
7	600.0	254.1	630.0	245.0	2
8	630.0	245.0	640.0	242.0	2
9	640.0	242.0	655.0	243.0	2
10	655.0	243.0	680.0	245.0	2
11	680.0	245.0	800.0	277.7	2
12	800.0	277.7	830.0	280.0	2
13	830.0	280.0	890.0	260.0	2
14	890.0	260.0	1030.0	220.0	2
15	1030.0	220.0	1050.0	210.0	2
16	1050.0	210.0	1060.0	210.0	5
17	40.0	224.0	170.0	232.0	4
18	170.0	232.0	200.0	233.5	4
19	200.0	233.5	260.0	240.0	4
20	260.0	240.0	400.0	238.0	4
21	400.0	238.0	570.0	240.0	5
22	570.0	240.0	640.0	242.0	7
23	640.0	242.0	641.0	240.0	7
24	641.0	240.0	670.0	230.0	5
25	670.0	230.0	700.0	225.0	5
26	700.0	225.0	740.0	220.0	5
27	740.0	220.0	790.0	215.0	5
28	790.0	215.0	840.0	205.0	5
29	840.0	205.0	900.0	201.0	5
30	900.0	201.0	970.0	200.0	5
31	970.0	200.0	1000.0	210.0	5
32	1000.0	210.0	1050.0	210.0	5
33	40.0	224.0	60.0	220.0	3
34	.0	210.0	60.0	220.0	5
35	60.0	220.0	170.0	229.0	5
36	170.0	229.0	200.0	230.0	5
37	200.0	230.0	400.0	238.0	5
38	570.0	240.0	641.0	240.0	5
39	.0	170.0	120.0	190.0	6
40	120.0	190.0	200.0	205.0	6
41	200.0	205.0	500.0	204.0	6
42	500.0	204.0	1200.0	175.0	6

ISOTROPIC Soil Parameters

7 Soil unit(s) specified

	Soil Unit Weight		Cohesion		Friction		Pore Pressure	
	Unit	Moist	Sat.	Intercept	Angle	Parameter	Constant	
Water	No.	(pcf)	(pcf)	(psf)	(deg)	Ru	(psf)	
Surface								
No.								

1	C&D	1	65.0	65.0	.0	26.00	.000	.0
1	MSW	2	63.0	300.0	300.0	23.00	.000	.0
1	Zone B	3	120.0	120.0	1500.0	.00	.000	.0
1	Zone C	4	120.0	120.0	.0	26.00	.000	.0
1	Zone D ₁	5	120.0	120.0	2000.0	.00	.000	.0
1	Zone D ₂	6	120.0	120.0	3500.0	.00	.000	.0
1	FILL	7	120.0	120.0	1000.0	.00	.000	.0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	230.00
2	1200.00	220.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

2500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 50 points equally spaced along the ground surface between x = 100.0 ft
and x = 350.0 ft

Each surface terminates between x = 520.0 ft
and x = 700.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
Upper angular limit := -5.0 degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	217.35	239.48
2	237.22	237.22
3	257.18	235.97
4	277.18	235.73
5	297.16	236.52
6	317.08	238.31
7	336.88	241.12
8	356.52	244.93
9	375.93	249.73
10	395.08	255.51
11	413.91	262.26
12	432.37	269.96
13	450.41	278.58
14	467.99	288.11
15	485.07	298.52
16	501.59	309.79
17	517.52	321.88
18	527.16	330.00

**** Simplified BISHOP FOS = 2.091 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Mundy Landfill Station N92+00

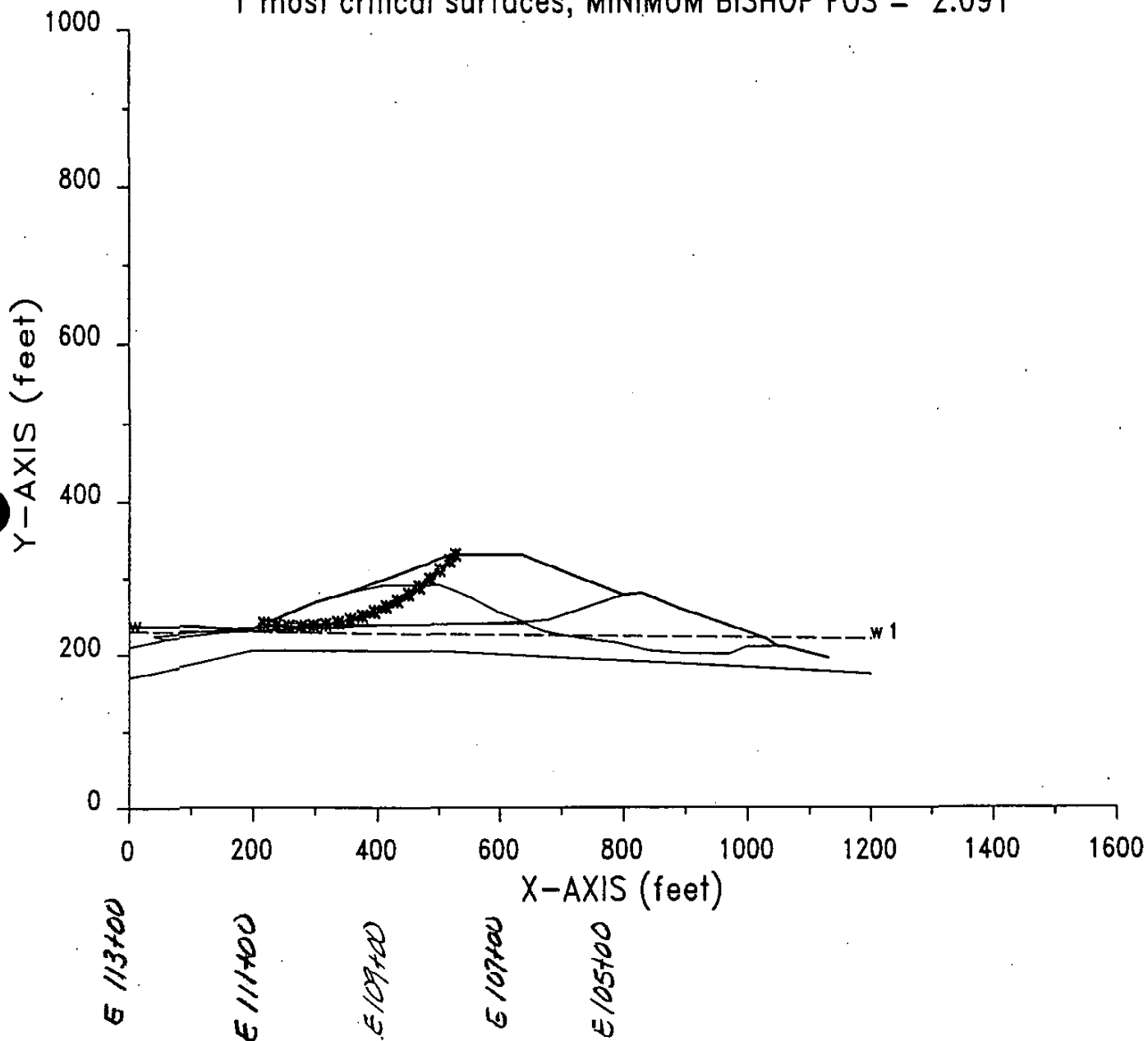
Resisting Moment (ft-lb)		FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)
1.135E+08	1.	2.091	271.81	629.08	393.38	217.35	527.16
1.473E+08	2.	2.114	290.36	650.74	415.09	222.45	553.68
1.272E+08	3.	2.121	288.16	642.31	403.88	227.55	544.19
1.050E+08	4.	2.160	295.68	592.30	353.20	232.65	532.13
1.642E+08	5.	2.184	313.67	646.57	409.89	232.65	573.94
2.460E+08	6.	2.193	276.62	803.39	569.31	212.24	592.88
8.881E+07	7.	2.218	327.11	513.54	275.13	247.96	531.82
2.937E+08	8.	2.268	281.70	849.99	616.19	212.24	612.27
1.277E+08	9.	2.268	331.75	576.83	337.35	247.96	561.63
9.131E+07	10.	2.268	289.01	620.58	375.15	242.86	526.17

* * * END OF FILE * * *

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Mundy Landfill Station N92+00

1 most critical surfaces, MINIMUM BISHOP FOS = 2.091



ST 2+00

E/104+00

E/106+00

E/108+00

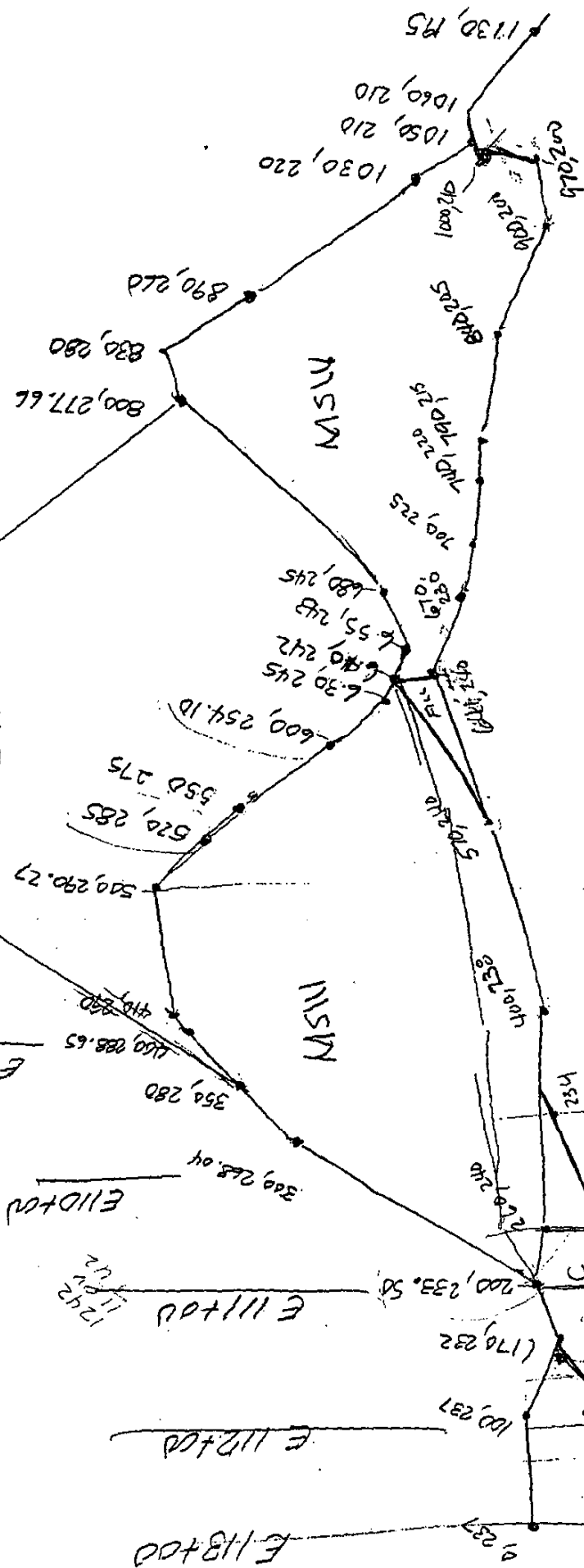
E/109+00

E/110+00

E/111+00

E/112+00

E/113+00



Soil	Type	X	C	D
1	C&D	100	0	26
2	MSW	63	300	23
3	B	120	0	0
4	C	120	0	26
5	D1	120	0	0
6	D2	120	0	0

130, 120, 110, 100, 90, 80, 70, 60, 50, 40, 30, 20, 10, 0

E/114+00

E/115+00

E/116+00

E/117+00

E/118+00

F.S. = 2.053

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*****
*               X S T A B L               *
*               Slope Stability Analysis   *
*               using the                  *
*               Method of Slices           *
*               Copyright (C) 1992 - 2000  *
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Problem Description : Mundy Landfill Station N92+50

 SEGMENT BOUNDARY COORDINATES

17 SURFACE boundary segments

Unit	Segment	x-left	y-left	x-right	y-right	Soil
Segment	No.	(ft)	(ft)	(ft)	(ft)	Below
	1	.0	225.0	50.0	235.0	3
	2	50.0	235.0	145.0	232.0	3
	3	145.0	232.0	150.0	230.0	5
	4	150.0	230.0	155.0	228.0	5
	5	155.0	228.0	160.0	230.0	5
	6	160.0	230.0	165.0	232.0	5
	7	165.0	232.0	185.0	232.0	5
	8	185.0	232.0	195.0	228.0	5
	9	195.0	228.0	220.0	234.0	4
	10	220.0	234.0	230.0	240.0	2
	11	230.0	240.0	300.0	265.0	2
	12	300.0	265.0	343.0	280.0	2
	13	343.0	280.0	385.0	290.0	2
	14	385.0	290.0	520.0	330.0	1
	15	520.0	330.0	635.0	330.0	1
	16	635.0	330.0	810.0	275.0	1
	17	810.0	275.0	1000.0	275.0	5

35 SUBSURFACE boundary segments

Unit	Segment	x-left	y-left	x-right	y-right	Soil
Segment	No.	(ft)	(ft)	(ft)	(ft)	Below
	1	385.0	290.0	430.0	295.0	2
	2	430.0	295.0	480.0	295.0	2
	3	480.0	295.0	510.0	290.0	2
	4	510.0	290.0	560.0	270.0	2
	5	560.0	270.0	605.0	250.0	2
	6	605.0	250.0	620.0	246.0	2
	7	620.0	246.0	650.0	241.0	2
	8	650.0	241.0	680.0	245.0	2
	9	680.0	245.0	775.0	270.0	2
	10	775.0	270.0	810.0	275.0	2
	11	810.0	275.0	870.0	275.0	2
	12	220.0	234.0	250.0	224.0	5
	13	250.0	224.0	410.0	227.0	5
	14	410.0	227.0	570.0	224.0	5
	15	570.0	224.0	620.0	245.0	5
	16	620.0	245.0	660.0	230.0	5
	17	660.0	230.0	700.0	225.0	5
	18	700.0	225.0	740.0	220.0	5
	19	740.0	220.0	790.0	215.0	5
	20	790.0	215.0	810.0	210.0	5
	21	810.0	210.0	840.0	205.0	5
	22	840.0	205.0	900.0	200.0	5
	23	.0	225.0	58.0	227.0	5
	24	58.0	227.0	145.0	232.0	5
	25	.0	190.0	110.0	200.0	7
	26	110.0	200.0	200.0	220.0	7
	27	200.0	220.0	410.0	211.0	7
	28	410.0	211.0	500.0	210.0	7
	29	500.0	210.0	590.0	200.0	7
	30	590.0	200.0	1000.0	200.0	7
	31	.0	184.0	110.0	190.0	6
	32	110.0	190.0	200.0	207.0	6
	33	200.0	207.0	500.0	206.0	6
	34	500.0	206.0	590.0	194.0	6
	35	590.0	194.0	1000.0	194.0	6

ISOTROPIC Soil Parameters

7 Soil unit(s) specified

Water	Soil	Unit Weight		Cohesion	Friction	Pore Pressure	
Surface	Unit	Moist	Sat.	Intercept	Angle	Parameter	Constant
No.	No.	(pcf)	(pcf)	(psf)	(deg)	Ru	(psf)
1	1	65.0	65.0	.0	25.00	.000	.0

1	2	63.0	63.0	300.0	23.00	.000	.0
1	3	120.0	120.0	1000.0	.00	.000	.0
1	4	120.0	120.0	.0	26.00	.000	.0
1	5	120.0	120.0	2000.0	.00	.000	.0
1	6	120.0	120.0	3500.0	.00	.000	.0
1	7	120.0	120.0	.0	26.00	.000	.0

1 Water surface(s) have been specified

Unit weight of water = 62.40 (pcf)

Water Surface No. 1 specified by 2 coordinate points

PHREATIC SURFACE,

Point No.	x-water (ft)	y-water (ft)
1	.00	230.00
2	1000.00	190.00

A critical failure surface searching method, using a random technique for generating CIRCULAR surfaces has been specified.

2500 trial surfaces will be generated and analyzed.

50 Surfaces initiate from each of 50 points equally spaced along the ground surface between x = .0 ft
and x = 230.0 ft

Each surface terminates between x = 500.0 ft
and x = 700.0 ft

Unless further limitations were imposed, the minimum elevation at which a surface extends is y = .0 ft

20.0 ft line segments define each trial failure surface.

 ANGULAR RESTRICTIONS

The first segment of each failure surface will be inclined within the angular range defined by :

Lower angular limit := -45.0 degrees
 Upper angular limit := -5.0 degrees

Factors of safety have been calculated by the :

* * * * * SIMPLIFIED BISHOP METHOD * * * * *

The most critical circular failure surface is specified by 18 coordinate points

Point No.	x-surf (ft)	y-surf (ft)
1	220.61	234.37
2	240.48	232.04
3	260.44	230.78
4	280.44	230.59
5	300.42	231.47
6	320.32	233.42
7	340.09	236.43
8	359.68	240.49
9	379.01	245.60
10	398.05	251.73
11	416.73	258.87
12	435.01	267.00
13	452.82	276.09
14	470.12	286.13
15	486.86	297.08
16	502.99	308.90
17	518.46	321.57
18	527.69	330.00

**** Simplified BISHOP FOS = 2.053 ****

The following is a summary of the TEN most critical surfaces

Problem Description : Mundy Landfill Station N92+50

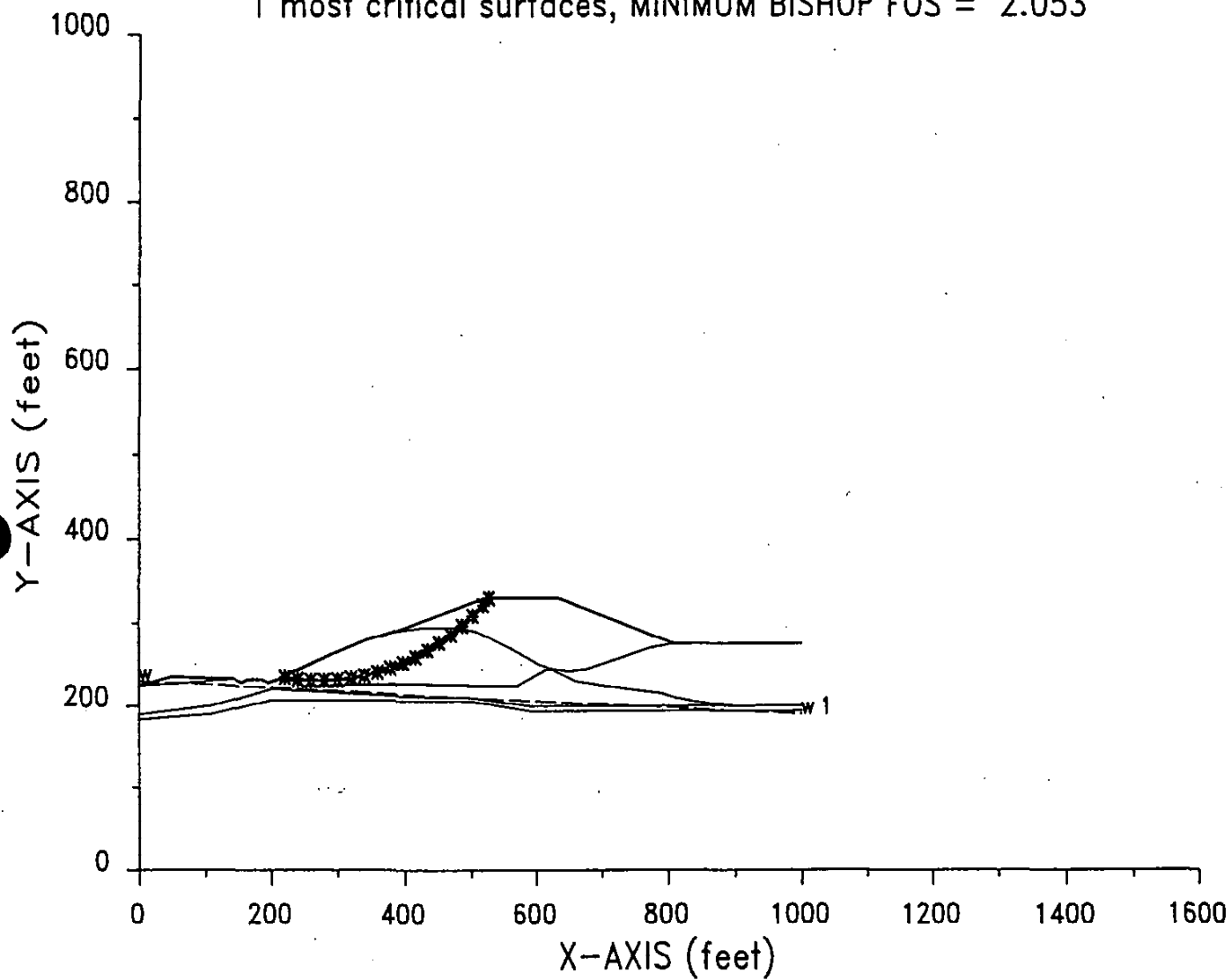
Resisting Moment (ft-lb)		FOS (BISHOP)	Circle Center x-coord (ft)	y-coord (ft)	Radius (ft)	Initial x-coord (ft)	Terminal x-coord (ft)
1.228E+08	1.	2.053	273.99	604.30	373.77	220.61	527.69
1.038E+08	2.	2.091	264.19	597.86	366.09	220.61	510.52
1.537E+08	3.	2.131	291.06	579.60	354.63	215.92	542.85
8.435E+07	4.	2.152	295.18	515.75	283.35	230.00	505.16
1.328E+08	5.	2.163	265.66	605.27	377.32	211.22	523.67
2.064E+08	6.	2.184	299.12	564.35	350.98	197.14	560.34
2.300E+08	7.	2.219	299.45	751.25	515.95	230.00	597.20
2.083E+08	8.	2.226	300.64	548.54	337.67	183.06	557.87
2.511E+08	9.	2.227	314.61	700.84	472.18	225.31	606.78
2.413E+08	10.	2.251	301.29	579.10	368.23	178.37	572.28

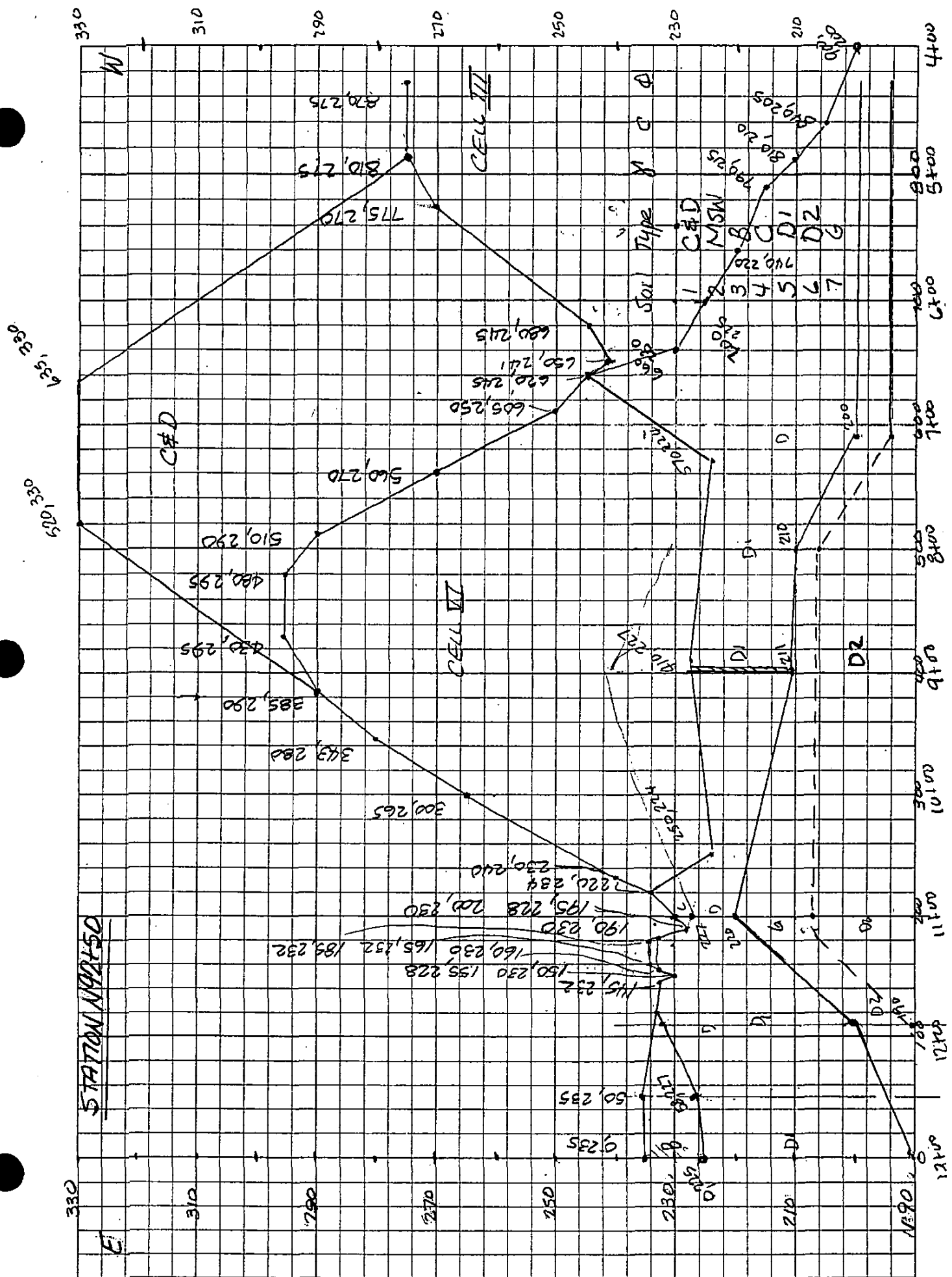
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Mundy Landfill Station N92+50

1 most critical surfaces, MINIMUM BISHOP FOS = 2.053



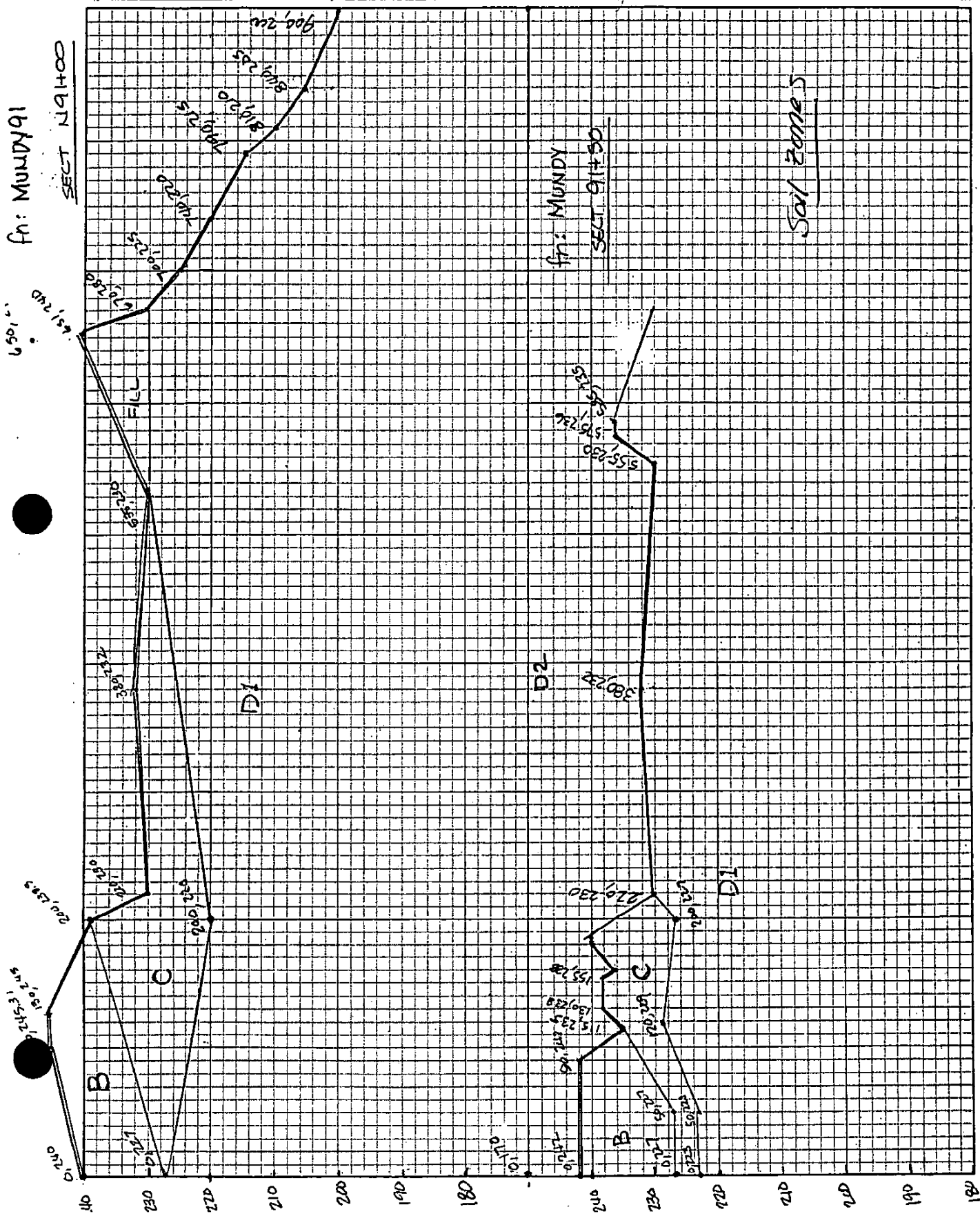


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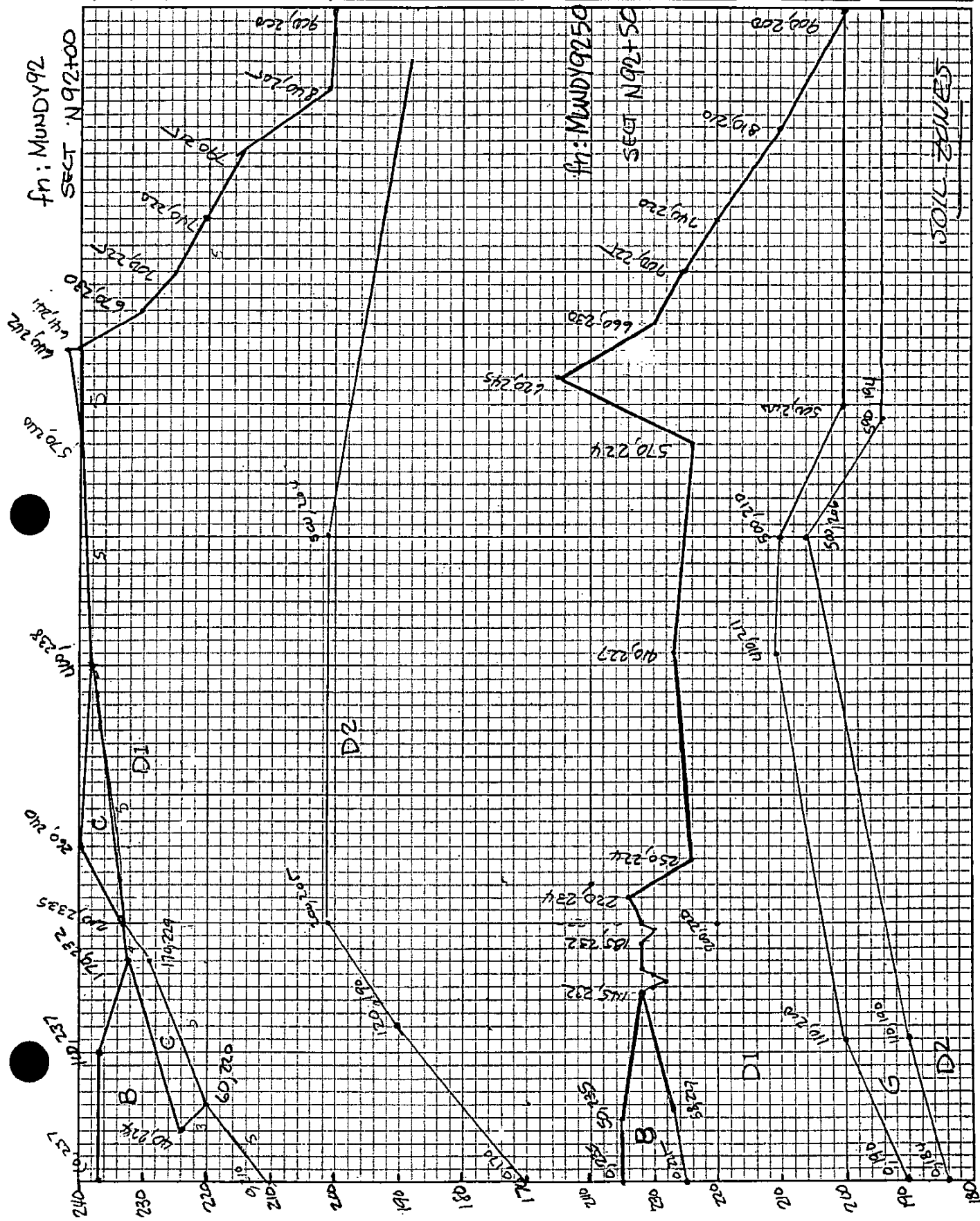
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*Mundy Landfill
Modification No. 2*

APPENDIX T-1c

Settlement Analysis

KLM

4/21/06

MSW Settlement - $t_{90} \sim 30$ yrs

Hyperbolic Model: $S = \frac{S_u}{1 + \frac{S_u}{P't}}$
(Settlement @ time t)

$$\text{Strain, } \epsilon = \frac{S}{T} = \frac{\frac{S_u}{T}}{1 + \frac{S_u}{P'T}}$$

$$\text{or } \epsilon = \frac{\epsilon_u}{1 + \frac{\epsilon_u}{P't}}$$

S_u = Ult. Settlement, $t = \infty$

P = time-rate Parameter

t = time

T = Waste thick

ϵ = Strain

ϵ_{ult} = Ult. Strain

typically, $\epsilon_{ult} \approx 8\%$

assume $t_{90} \approx 30$ yrs

$$T_{90} = \frac{\epsilon}{\epsilon_u} = \frac{1}{1 + \frac{\epsilon_u}{P't}}$$

$$0.90 = \frac{1}{1 + \frac{0.08}{P'(30)}}$$

$$1 + \frac{0.00267}{P'} = 1.1111$$

$$P' = 0.024$$

$$\epsilon = \frac{\epsilon_u}{1 + \frac{3.333}{t}}$$

Existing MSW in Cells I, II, III, & IV

Cell	Utilization Sequence	Since 2006	~ AVE
I	July 1985 - Dec 1997	21 yrs <u>SAY</u>	10 yrs
II	Nov 1985 - Dec 1997	21 yrs —	10 yrs
III	Jan 1989 - Dec 1997	17 yrs —	8 yrs
VI	Dec 1997 → 2006	9 yrs —	4 yrs

Cells I & II

YEAR 2006
 $t = 10$ YRS

$$\epsilon = \frac{0.08}{1 + \frac{3.333}{t}} = \frac{0.08}{1 + \frac{3.333}{10}} = 0.060$$

Δt	YEAR	$\bar{\epsilon}$ $\Delta t + 10$	$\epsilon = \frac{\epsilon_u}{1 + \frac{\epsilon_u}{P't}}$	$\Delta \epsilon$ $\epsilon - 0.060$
4	2010	14	0.045	0.005
9	2015	19	0.068	0.008
19	2025	29	0.072	0.012
29	2035	39	0.074	0.014
∞	∞	∞	0.08	0.020 - max

Cell III

$t \approx 8$ yrs
YR - 2006

$$\bar{\epsilon} = \Delta t + 8$$

$$\epsilon = 0.08 / (1 + \frac{3.33}{8}) = 0.056$$

$$\Delta \epsilon = \epsilon - 0.056$$

4	2010	12	0.0626	0.007
9	2015	17	0.0669	0.0109
19	2025	27	0.0712	0.0152
29	2035	37	0.0734	0.0174
∞	∞	∞	0.08	0.024 - max

SCORE

Board
Code

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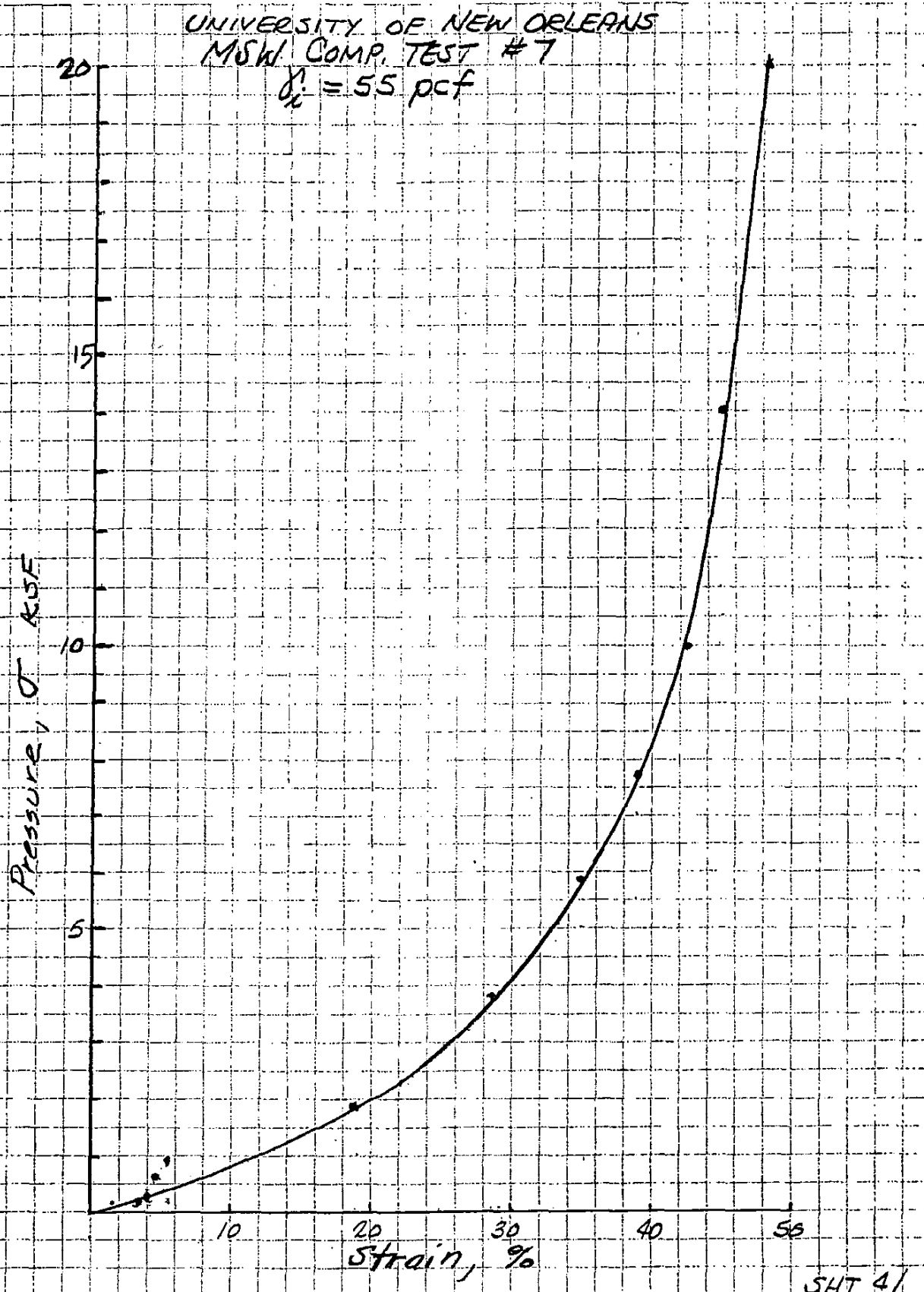
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PAGE ____ OF ____ OF PROBLEM NO.



PROJECT NO.	KLM
DATE	4/21/06

MSW Settlement - $t_{90} = 30$ yrs

Cell VI Year 2006, $t_{ave} = 4$ yrs $E = \frac{0.08}{1 + \frac{3.33}{4}} = 0.0436$

<u>Δt</u>	<u>YEAR</u>	<u>$\bar{t} = \Delta t + 4$</u>	<u>$E = 0.08 / (1 + (3.33/\bar{t}))$</u>	<u>$\Delta E = E - 0.0436$</u>
4	2010	8	0.0565	0.0129
9	2015	13	0.0637	0.0201
19	2025	23	0.0699	0.0263
29	2035	33	0.0727	0.0291
∞	∞	∞	0.08	0.0364

Cells I & II

$$\Delta S_9 = 0.008 \times T_0$$

$$\Delta S_{19} = 0.012 \times T_0$$

$$\Delta S_{29} = 0.014 \times T_0$$

$$\Delta S_{\infty} = 0.02 \times T_0$$

Cell III

$$\Delta S_9 = 0.0109 \times T_0$$

$$\Delta S_{19} = 0.0152 \times T_0$$

$$\Delta S_{29} = 0.0174 \times T_0$$

$$\Delta S_{\infty} = 0.024 \times T_0$$

Cell VI

$$\Delta S_9 = 0.0201 \times T_0$$

$$\Delta S_{19} = 0.0263 \times T_0$$

$$\Delta S_{29} = 0.0291 \times T_0$$

$$\Delta S_{\infty} = 0.0364 \times T_0$$



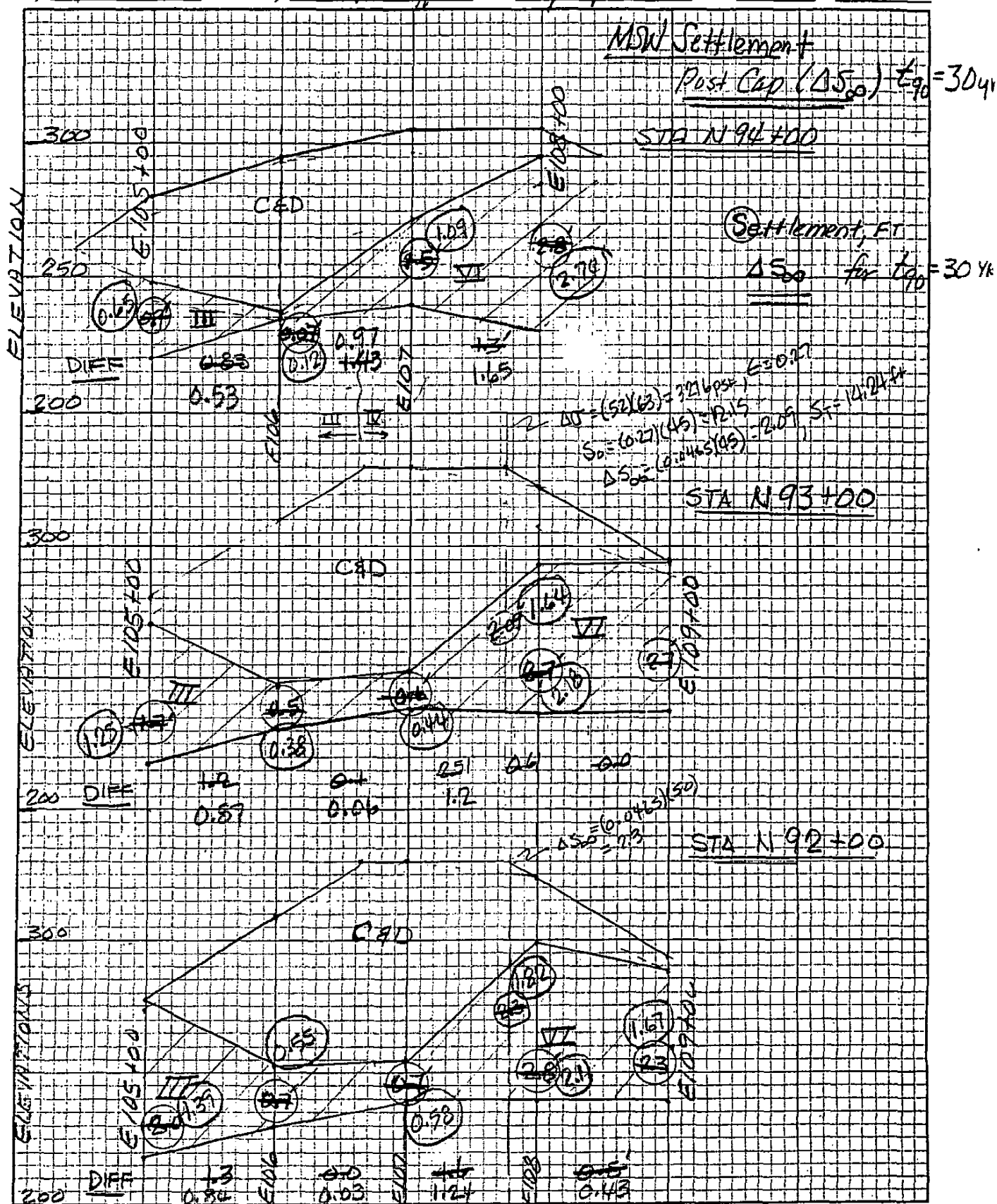
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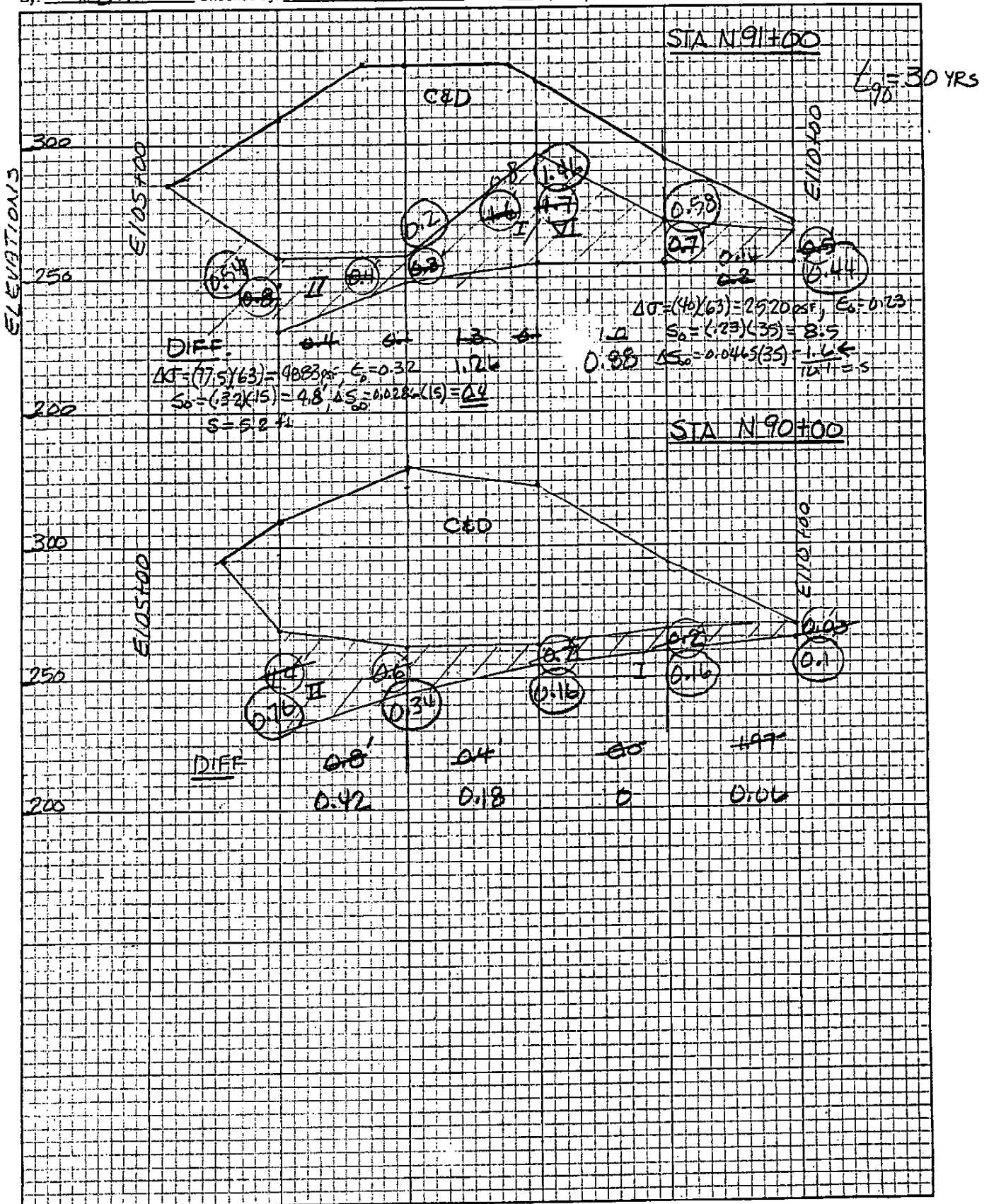
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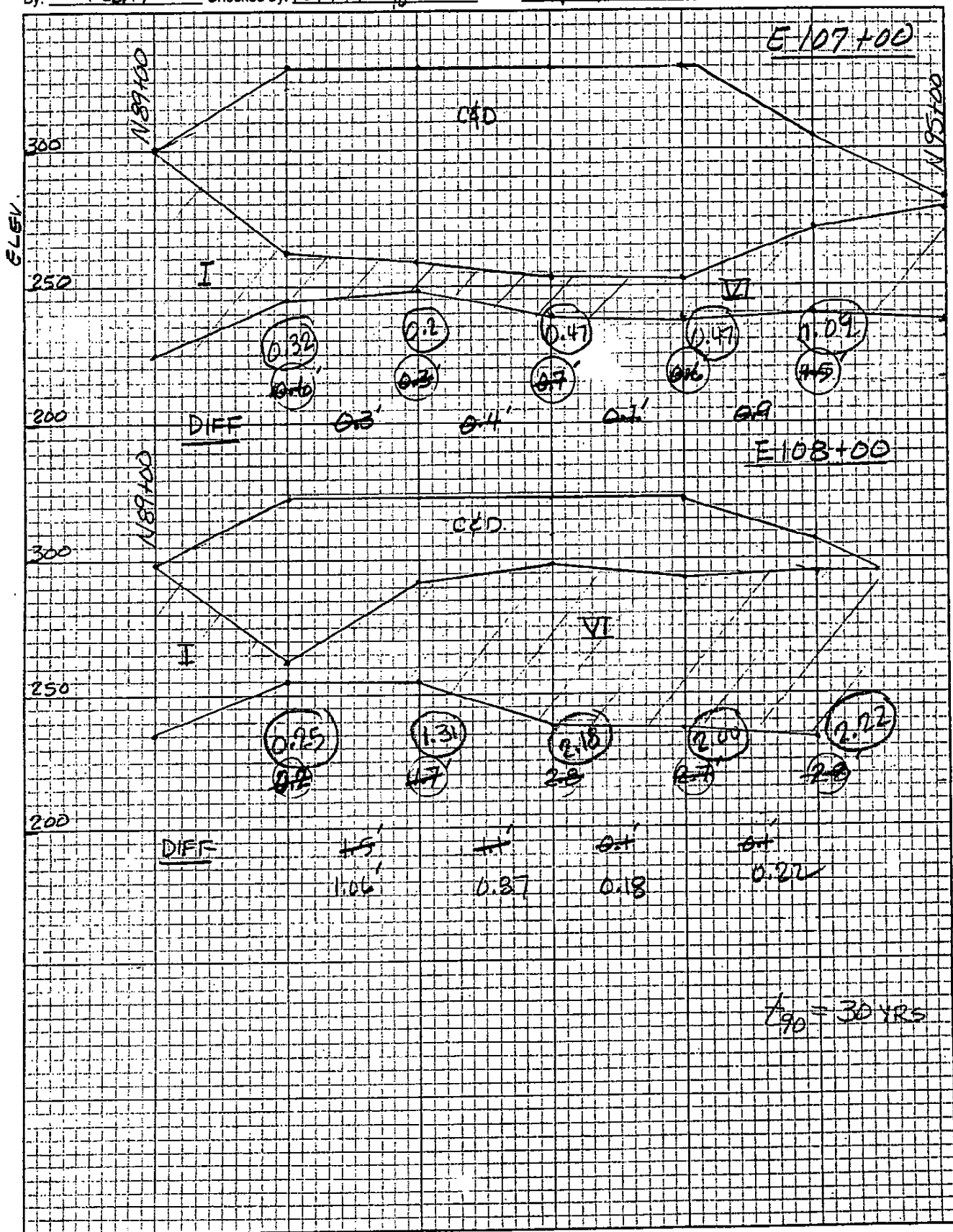
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Cap Settlement (MSW)

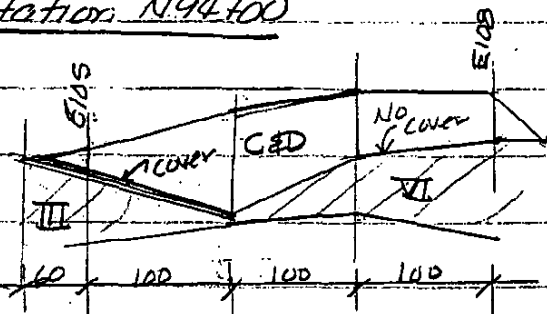
Settlement issues

Cells I, II & III (w/Final Covers)

$$\begin{aligned} S_o \text{ w/ } T_u \text{ (CD\&T)} &\rightarrow f(T_u \neq T_o) \\ \Delta S \text{ w/ } \Delta t &\rightarrow f(t_{90}, T_o, \Delta t) \end{aligned}$$

CD\&T Cover $\Delta S \text{ w/ } \Delta t \rightarrow f(t_{90}, T_o, \Delta t)$

Station N94+00



STA	S _{MSW}	H _{MSW} *	S _{SOIL} *	CELL
E105	7.0'	32'	3.3"	III
E106	0.8'	58'	4.7"	III
E107	8.7'	34'	3.4"	VI
E108	10.1'	10'	2.3"	VI

0 7.28' 1.19' 8.98 10.3'

* See insitu Soil Settlement Calc.

Cell III MAX DIFF Settlement = 7.28 - 1.19 = 6.09 ft

OVER 160 ft

$$\begin{aligned} \text{Cover Bending } \epsilon_b &= \frac{6TS}{B^2} = \frac{(6)(2)(6.09)}{160^2} \\ &= 2.85 \times 10^{-3} \end{aligned}$$

Stress
Criterion

$$\begin{aligned} \sigma &= \epsilon_b E_s \leq K_o \delta h \quad (142.5 \leq 1008 \text{ PSI}) \\ (0.00285)(50,000) &\leq \left(\frac{1}{2}\right)(63)(32) \quad \underline{\underline{O.K.}} \end{aligned}$$

Elongation

$$\begin{aligned} R &= \frac{B^2}{8s} + \frac{s}{2} = \frac{160^2}{8 \times 6.09} + \frac{6.09}{2} \approx 528.5 \\ \epsilon_e &= \sqrt{2} \left[\left(\frac{2R}{B} \right) \sin^{-1} \left(\frac{B}{2R} \right) - 1 \right] \\ &= \sqrt{2} \left[\left(\frac{2 \times 528.5}{160} \right) \sin^{-1} \left(\frac{160}{2 \times 528.5} \right) - 1 \right] \\ &= 3.86 \times 10^{-3} \end{aligned}$$

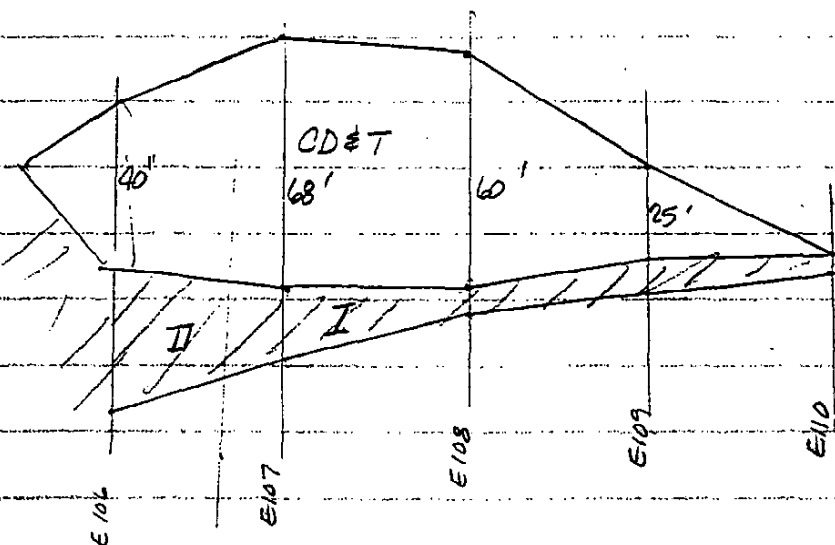
Total $\epsilon = \epsilon_b + \epsilon_e$

$$= 0.00285 + 0.00386$$

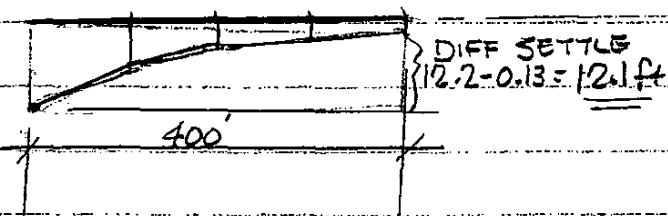
$$= 0.00671 < 1\% \text{ Strain} \quad \underline{\underline{O.K.}}$$

\therefore No tensile cracking

Cap Settlement - Cell I & II Sta N90+00



$S_0 + \Delta S_{\infty}$	11.9'	6.9'	2.3'	1.9'	0.13'
$\Delta h_{\text{in situ}}$	3.8"	5.4"	4.8"	2.9"	
Total Settle	12.2'	7.4'	2.7'	2.1'	0.13'



Cell I & II Cover bending $\epsilon_b = \frac{6TS}{B^2} = \frac{(6)(2)(12.1)}{(400)^2} = 9.1 \times 10^{-4}$

$\sigma_b = E\epsilon = (50,000)(.00091)$
 $= 45.5 \text{ psi} < K_o \gamma h = (\frac{1}{2})(63)(40)$

Elongation - $R = \frac{B^2}{8S} + \frac{S}{2} = \frac{(400)^2}{8 \times 12.1} + \frac{12.1}{2} = 1658.9$

$\epsilon_e = \sqrt{2} \left[\left(\frac{12R}{B} \right) \sin^{-1} \left(\frac{B}{2R} \right) - 1 \right]$
 $= \sqrt{2} \left[\left(\frac{2 \times 1658.9}{400} \right) \sin^{-1} \left(\frac{400}{2 \times 1658.9} \right) - 1 \right]$
 $= -2 \times 10^{-7}$

$\epsilon_T = \epsilon_b + \epsilon_e < 1\%$ No tensile cracks ✓

MSW Settlement Cap (assumes $t_{90} \approx 30$ yrs)

KLM

4/23/06

initial MSW settlement takes place with in place compaction as determined by -

$$\delta_0 = T_0 \times E_0$$

T_N = additional C/D & T.
Waste Ht

E_0 = initial strain
from UNO σ - ϵ tests

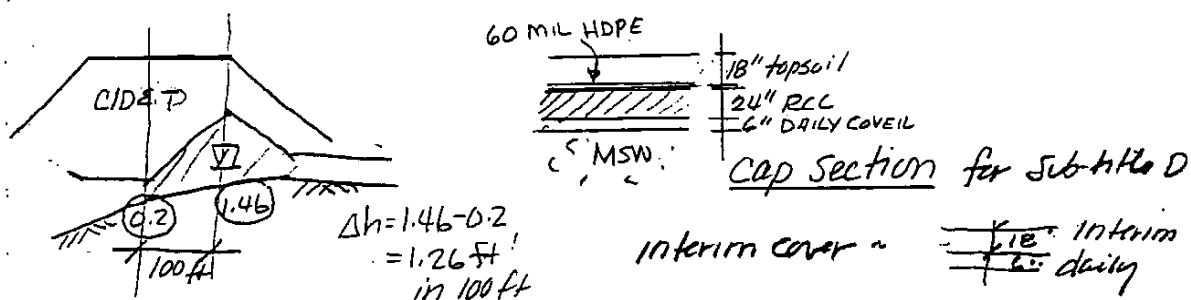
— with $\sigma = T_N \times 63$ pct

T_0 = MSW thickness

Max Post closure MSW settlements

$$\Delta \epsilon = \Delta \epsilon - E_0$$

Max diff settlement estimated as 1.26 ft in 100 ft St 91+00



Max settlement in insitu clay for St 92+00 is $\sim 6.3''$ ($H \approx 80$ ft)
(however settlement uniform and does not contribute to)
diff settlement. $\therefore \Delta S = 1.26$ ft

CELL VI

Cover Bending
$$\epsilon_b = \frac{6TS}{B^2} = \frac{(6)(2)(1.26)}{100^2} = 1.5 \times 10^{-3}$$

$$\sigma_b = (100,000)(1.5 \times 10^{-3}) = 150 \text{ psf}$$

Elongation

$$R = B^2/8S + \frac{S}{2} = \frac{100^2}{8 \times 1.26} + \frac{1.26}{2} = 992.69$$

$$\begin{aligned} \epsilon_e &= \sqrt{2} \left[\left(\frac{2R}{B} \right) \sin^{-1} \left(\frac{B}{2R} \right) - 1 \right] \\ &= \sqrt{2} \left[\left(\frac{2 \times 992.69}{100} \right) \sin^{-1} \left(\frac{100}{2 \times 992.69} \right) - 1 \right] \\ &= 4.23 \times 10^{-4} \end{aligned}$$

Stress Criteria

$$\sigma_e = (100,000)(4.23 \times 10^{-4}) = 42 \text{ psf} < K_o \gamma H \quad \text{OK}$$

Total Strain -
$$\epsilon_T = \epsilon_b + \epsilon_e$$

$$= 0.0015 + 0.000423$$

$$= 0.0019 < 1\% \quad \text{OK} \quad \text{No tensile cracking}$$

KLM

4/4/06

Settlement - Insitu Soils

Consolidation tests Boring No 16 { N78+69
E 99+83

(C1) Sample Depth 8'-10' laminations of very stiff tan clay

$$\gamma = \gamma_d(1+w)$$

$$= (86.1)(1.301) = 112 \text{ pcf}$$

LL=51, PL=30, PI=21

$$\sigma'_o = (112)(9)/2000 = 0.504 \text{ tsf}$$

$$\sigma'_p = 1.25 \text{ tsf}$$

$$\alpha_{CR} \approx 2.5$$

consolidation lab curve

$$C_{rc} = 0.104 - 0.02 = 0.014$$

$$C_{cc} = 0.065 - 0.01 = 0.055$$



(C2) Sample Depth 46'-48' laminations of hard dark gray clay
& dense light gray sandy clay { LL=94
PL=31
PI=13

Water table est @ 36' depth. (264-36 = 228 ft EL - say 230 ft)

$$\gamma = (94)(1+0.27) = 119.4 \text{ pcf}$$

$$\sigma'_o = \left(\frac{112+119.4}{2} \right)(47) - (47-34)(62.4) = 5437.9 - 811.2$$

$$= 4626.7 \text{ tsf}$$

$$\sigma'_p \approx 2.3 \text{ tsf}$$

~~maximally consolidated~~ - consol lab curve

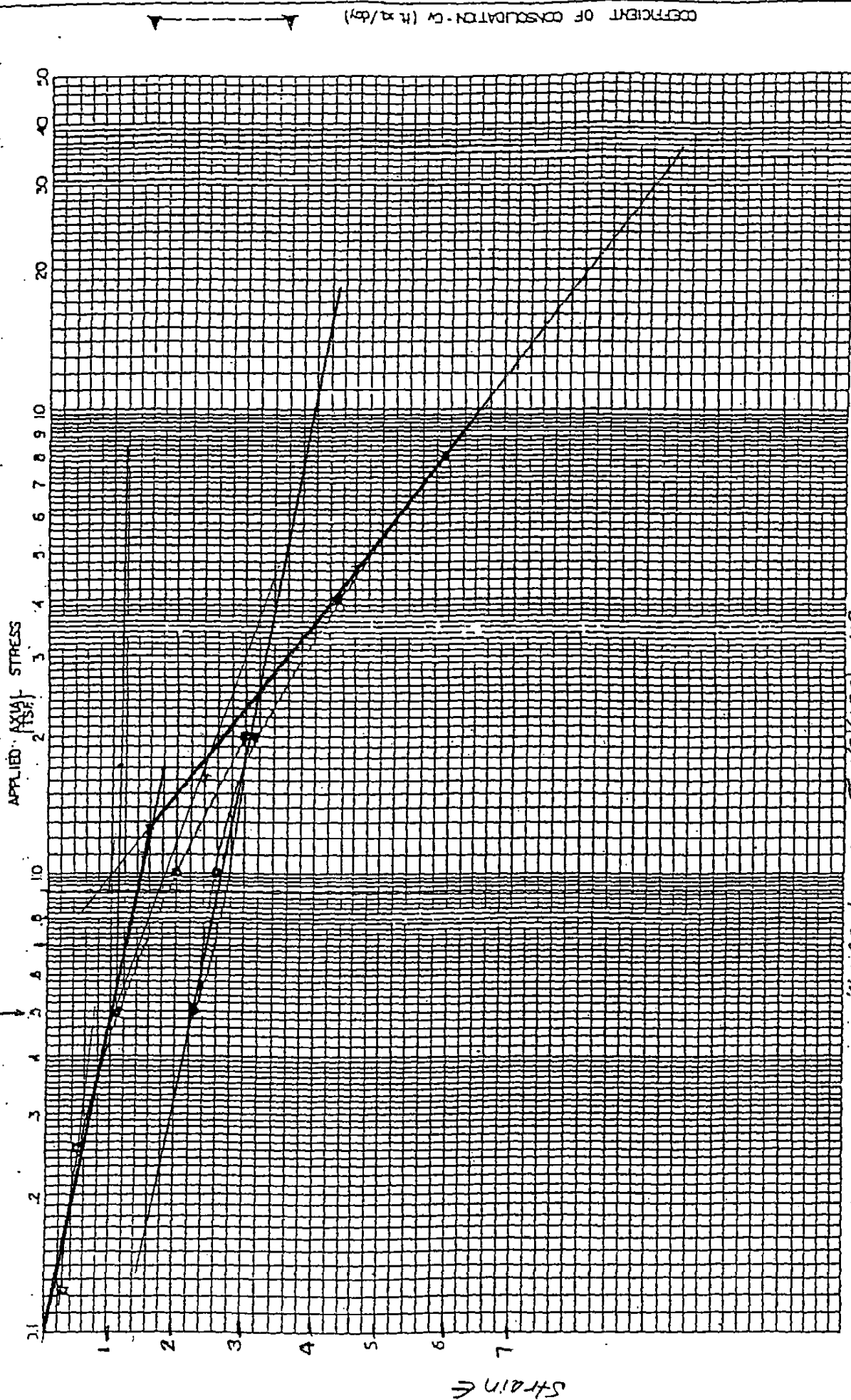
$$C_{rc} = 0.088 - 0.018 = 0.07$$

inconsistent w/ other tests and site investigation

test curve may be disturbed specimen

Area is underlain by thick stiff clays.

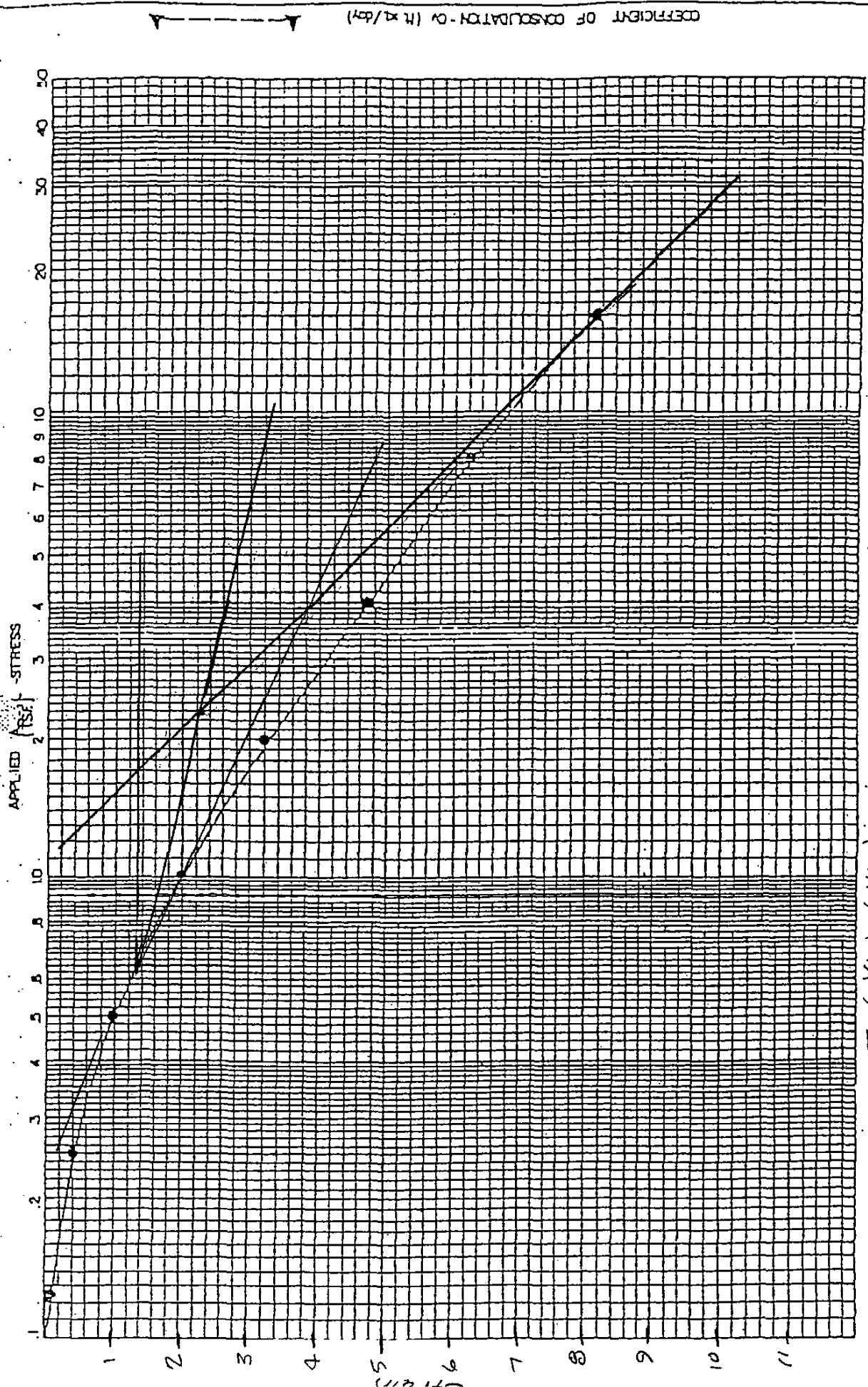
disregard
KLM



SAMPLE IDENTIFICATION
 Boring No: B-1
 Depth (ft): 8' to 10'
 Material: Laminations of very stiff tan clay & light

CLASSIFICATION DATA
 Initial Moisture Content (%): 30.2
 Initial Dry Density (lb_s/cu ft): 86.1
 Final Moisture Content (%): 31.4
 LL: 51
 PL: 30
 PI: 21

CONSOLIDATION TEST
 $\sigma_p \approx 1.25 \text{ tsf}$
 $\sigma'_0 = 9(1.25) = 11.25 \text{ tsf}$
 $C_c = 0.0615 - 0.01 = 0.055$
 $C_r = 0.004 - 0.0026 = 0.0014$
 $\alpha_{CR} \approx 2.5$



SAMPLE IDENTIFICATION $\sigma'_0 = (47)(125) - (13)(125)$ CONSOLIDATION TEST

BORING NO. B-1
DEPTH (ft) 46' to 48'
MATERIAL Laminations of hard dark gray clay & dense light gray sandy silt, 30 to 60

Zone D
Soil:
CLASSIFICATION DATA
INITIAL MOISTURE CONTENT (%) 27.0
INITIAL DRY DENSITY (lb./cu ft.) 94.0
FINAL MOISTURE CONTENT (%) 27.2

LL 44
PL 31
PI 13

Settlement Insitu Soils

4/6/06

Consolidation Tests:Boring B.309 (Elev. 162.62' msl)

Sample depth 16'-18' - say 17 ft

WT \approx 17 ft depth, $\gamma = (1+e)\gamma_d = (1.21)(101.5) = 124$ pcf

$$\sigma'_0 = 17 \times 124 = 2108 \text{ psf} = 1.05 \text{ tsf}, e_0 = 0.629$$

$$\sigma'_p \approx 2.60 \quad (\text{lab consolidation test})$$

$$OCR = \frac{2.60}{1.05} = 2.5$$

$$C_r = 0.578 - 0.556 = 0.022$$

$$C_{re}' = \frac{C_r}{1+e_0} = \frac{0.022}{1.629} = 0.014$$

$$C_c = 0.62 - 0.408 = 0.212$$

$$C_{ce}' = \frac{C_c}{1+e_0} = 0.13$$

Boring-B.310 (Elev. 169.00' msl)

Sample depth 26'-28' - say 27 ft

WT not noted, assume 17 ft $\gamma = (1+e)\gamma_d = (1.21)(102.1) = 124$ pcf

$$\sigma'_0 = (27)(124) - (27-17)(62.4) = 3348 - 624 = 2724 \text{ psf} \quad (e_0 = 0.62)$$

$$= 1.36 \text{ tsf} \quad \text{or } 1.67 \text{ tsf if above WT}$$

$$\sigma'_p = 3.8 \text{ tsf} \quad (\text{lab consolidation test})$$

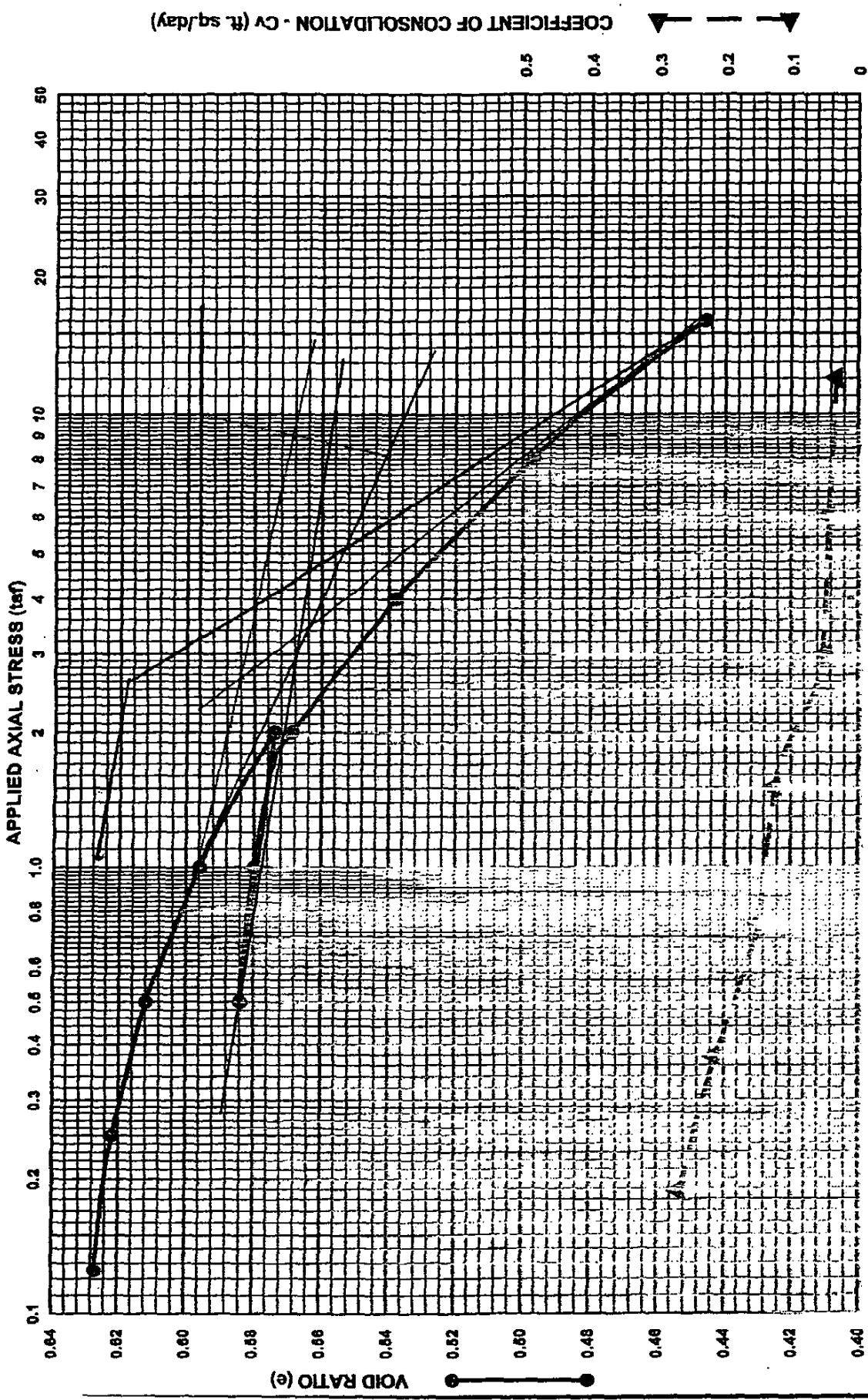
$$OCR = 3.8 / 1.36 = 2.8 \quad \text{or } 2.3$$

$$C_r = 0.595 - 0.573 = 0.022, \quad C_{re}' = \frac{0.022}{1+e_0} = 0.014$$

$$C_c = (0.61^{0.69} - 0.541) / 1.09^{0.4702} = 0.164 \quad C_{ce}' = 0.14 / 1.62 = 0.101$$

P:\2005\05-1124\CADD\051124 CS B309 16-18.dwg

Oct 10, 2005 - 10:11:39



CONSOLIDATION TEST

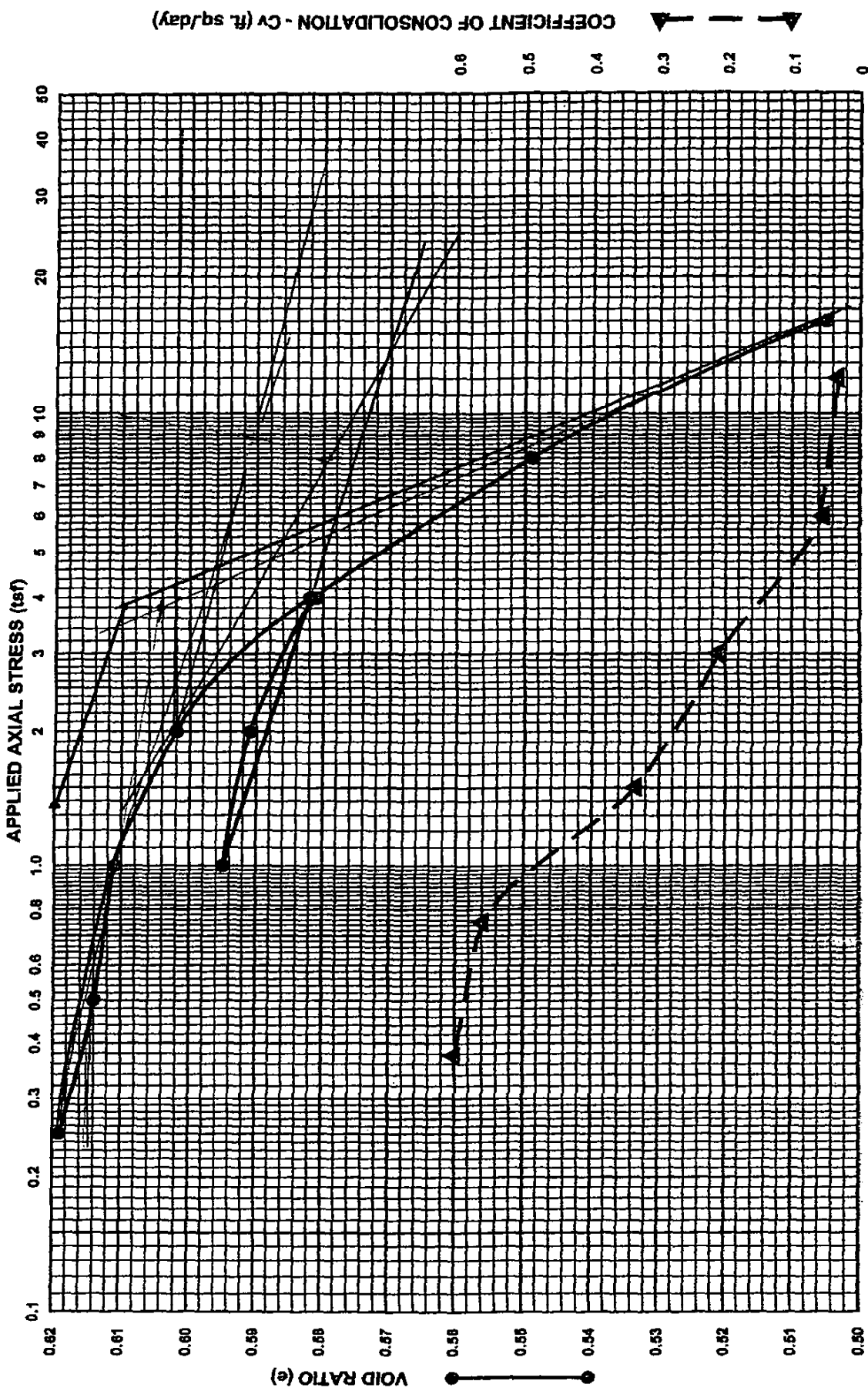
SAMPLE IDENTIFICATION
BORING NO.: B-309
DEPTH (feet): 16-18
MATERIAL: Gray & light gray SILTY CLAY
with some nodules & organics
FILE NO.: 05-1124

CLASSIFICATION DATA
INITIAL MOISTURE CONTENT (%) = 21.7 LL = 34
INITIAL DRY DENSITY (lbs./cu.ft.) = 101.5 PL = 14
FINAL MOISTURE CONTENT (%) = 18.9 PI = 20
E_o = 0.629 G_s = 2.65
Assumed

FIGURE NO.:

P:\2005\05-1124\CADD\051124 CS B310 26-28.dwg

Oct 10, 2005 - 10:25am



CONSOLIDATION TEST

CLASSIFICATION DATA

STE

Soil Testing Engineers, Inc.

SAMPLE IDENTIFICATION $C_c = 1.36$

BORING NO.: B-310

DEPTH (feet): 26-28

MATERIAL: Dark gray CLAY w/silt pockets

FILE NO.: 05-1124

INITIAL MOISTURE CONTENT (%) = 21.1

INITIAL DRY DENSITY (lbs./cu.ft.) = 102.1

FINAL MOISTURE CONTENT (%) = 23.3

LL = 56

PL = 21

Pi = 35

Es = 2.65

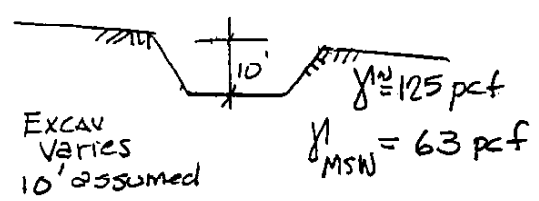
Assumed

FIGURE NO.:

Settlement - Insitu Soils

The proposed C&D valley cell will piggyback on and be in between cells I, II, III and VI. Cells I thru III are pre-subtitle D. Cell VI is a subtitle D cell, meeting all liner and LCS requirements. Cells I, II, and III have clay liners and leachate collection systems, also.

Excavation depths vary in the previous cells. Section C-C' for the N-S cross-section of Sht JEI-5 provides an estimate excavations approximately +/- 10 ft for cell VI. Bottom excavations are also shown on AFJM sheets 17-20 for cell VI



$$\begin{aligned} \text{unload: } & -(10)(125) = -1250 \text{ psf} \\ \text{Reload: } & +(10)(63) = +630 \text{ psf} \\ \text{no settlement until waste ht: } & (1250-630)/63 \\ & = 9.8 \text{ ft} \end{aligned}$$

REBOUND

B016 - Consol Test C1 (8'-10' length)
Ref Table 1-A

Soil ~ 10 ft above grade

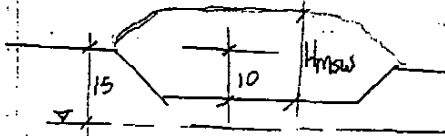
Consolidation Test											
DEPTH BELOW GRADE	\bar{Z} FT. below EXCAV.	$\bar{\sigma}_0$ TSF	$\Delta\sigma$ TSF	$\bar{\sigma}_F$ TSF	or $\Delta E = C_{re} \times \log(\frac{\sigma_F}{\sigma_0})$			h in	Δh in	$\Sigma \Delta h$ in	
					E_0	E_f	ΔE				
$\sigma_0 = (\bar{Z} + 10) \gamma$	10-15	2.5	0.78	0.63	0.15	$(\Delta E = C_{re} \log \frac{\sigma_F}{\sigma_0})$			60"	-0.60	0.60
$\Delta \sigma = 10 \gamma$	15-20	7.5	1.09	"	0.46	→ -0.005			"	-0.31	0.91
$\bar{\sigma} = \bar{\sigma} - \Delta \sigma$	20-25	12.5	1.41	"	0.78	-0.0036			"	-0.22	1.13
	25-30	17.5	1.72	"	1.09	-0.0028			"	-0.17	1.30
	30-35	22.5	2.03	"	1.41	-0.0022			"	-0.13	1.43
	35-40	27.5	2.34	"	1.71	-0.0019			"	-0.11	1.54
	40-45	32.5	2.66	"	2.03	-0.0016			"	-0.10	1.64
	45-50	37.5	2.97	"	2.34	-0.0014			"	-0.09	1.73
	50-55	42.5	3.28	"	2.65	-0.0013			"	-0.08	1.81
	55-60	47.5	3.59	"	2.96	-0.0012			"	-0.07	1.88
	65-70	52.5	3.91	"	3.28	-0.0011			"	-0.06	1.94
	70-75	57.5	4.22	"	3.59	-0.0010			"	-0.06	2.00

DESIGNED BY	KLM
DATE	4/6/06

Settlement - Insitu Soils

For 10 ft excavation $\Delta\sigma = 63(H_{MSW} - 10)$

Consolidation Test B016 - $C_{rc} = 0.014$, $C_{cc} = 0.06$



$$OCR = 2.5 \quad \sigma_p = 2.5\sigma_o = 125$$

$$\Delta\sigma = 63(H_{MSW} - 10)$$

Assume WT 15' below grade (5' below liner)

$$\Delta\sigma = 63(H_{MSW} - 10)$$

$$\Delta\epsilon = C_{rc} \log \frac{\sigma_F}{\sigma_o} \quad (\sigma_o + \Delta\sigma \leq 2.5\sigma_o)$$

$$\Delta\epsilon = C_{rc} \log \frac{\sigma_F}{\sigma_o} + C_{cc} \log \frac{\sigma_o + \Delta\sigma}{\sigma_p} \quad (\sigma_o + \Delta\sigma \geq 2.5\sigma_o)$$

$$\sigma_o = (Z + 10)(125), \quad U = (Z - 2.5)(624)$$

$H_{MSW} = 30 \text{ FT}$	Depth Below Liner	Z	TOTAL $\frac{\sigma_o}{\text{TSF}}$	U	σ_o'	$\frac{\Delta\sigma}{\text{TSF}}$	$\frac{\sigma_F}{\text{TSF}}$	$\Delta\epsilon$	H in	Δh in	$\Sigma \Delta h$ in
WT	5	2.5	0.78	-	0.78	0.63	1.41	0.0036	60	0.22	0.22
	10	7.5	1.09	0.08	1.01	"	1.64	0.003	"	0.18	0.40
	15	12.5	1.41	0.23	1.18	"	1.81	0.0026	"	0.156	0.556
	20	17.5	1.72	0.39	1.33	"	1.92	0.0024	"	0.14	0.697
	25	22.5	2.03	0.55	1.48	"	2.11	0.0022	"	0.13	0.83
	30	27.5	2.34	0.70	1.64	"	2.27	0.0020	"	0.12	0.95
	35	32.5	2.66	0.86	1.80	"	2.43	0.0018	"	0.11	1.05
	40	37.5	2.97	1.01	1.97	"	2.59	0.0017	"	0.10	1.15
	45	42.5	3.28	1.17	2.11	"	2.74	0.0016	"	0.10	1.25
	50	47.5	3.59	1.33	2.26	"	2.89	0.0016	"	0.09	1.34

$H_{MSW} = 40 \text{ FT}$

$$\Delta\sigma = 63(40 - 10) = 1890 \text{ psf} = 0.945 \text{ TSF}$$

$$\sigma_o + \Delta\sigma < \sigma_p$$

$H_{MSW} = 40 \text{ FT}$	Depth Below Liner	Z	TOTAL $\frac{\sigma_o}{\text{TSF}}$	U	σ_o'	$\frac{\Delta\sigma}{\text{TSF}}$	$\frac{\sigma_F}{\text{TSF}}$	$\Delta\epsilon$	H in	Δh in	$\Sigma \Delta h$ in
	5	2.5	0.78	-	0.78	0.945	1.725	0.0048	60	0.288	0.288
	10	7.5	1.09	0.08	1.01	"	1.955	0.0040	"	0.24	0.528
	15	12.5	1.41	0.23	1.18	"	2.125	0.0036	"	0.216	0.744
	20	17.5	1.72	0.39	1.33	"	2.275	0.0033	"	0.196	0.940
	25	22.5	2.03	0.55	1.48	"	2.425	0.003	"	0.180	1.120
	30	27.5	2.34	0.70	1.64	"	2.585	0.0028	"	0.166	1.286
	35	32.5	2.66	0.86	1.80	"	2.745	0.0026	"	0.154	1.44
	40	37.5	2.97	1.01	1.97	"	2.915	0.0024	"	0.143	1.583
	45	42.5	3.28	1.17	2.11	"	3.055	0.0022	"	0.135	1.718
	50	47.5	3.59	1.33	2.26	"	3.175	0.0021	"	0.11	1.828

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4/6/06

Settlement - Inside Soils - 10 ft excavation

Depth Below Liner	\bar{z}	$\frac{\sigma'_0}{\sigma'_0 + \Delta\sigma}$	u	σ'_0	$\Delta\sigma$ TSF	σ'_F TSF	$\Delta\epsilon$	h in	Δh in	$\Sigma\Delta h$ in
$H_{MSW} = 20 \text{ ft}$ $(\sigma'_0 + \Delta\sigma < \sigma'_p)$ $\Delta\sigma = 63(20-10) = 630 \text{ psf} = 0.315 \text{ TSF}$										
5	2.5	0.78	-	0.78	0.315	1.095	0.0021	60	0.124	0.124
10	7.5	1.09	0.08	1.01	"	1.325	0.0016	"	0.099	0.223
15	12.5	1.41	0.23	1.18	"	1.495	0.0014	"	0.086	0.309
20	17.5	1.72	0.39	1.33	"	1.645	0.0013	"	0.078	0.387
25	22.5	2.03	0.55	1.48	"	1.795	0.0012	"	0.070	0.457
30	27.5	2.34	0.70	1.64	"	1.955	0.0011	"	0.064	0.521
35	32.5	2.66	0.86	1.80	"	2.115	0.001	"	0.059	0.58
40	37.5	2.97	1.01	1.97	"	2.285	0.0009	"	0.054	0.634
45	42.5	3.28	1.17	2.11	"	2.425	0.0008	"	0.051	0.685
50	47.5	3.59	1.33	2.26	"	2.575	0.0008	"	0.048	0.733

$H_{MSW} = 50 \text{ FT}$ $\Delta\sigma = 63(50-10) = 1.26 \text{ TSF}$ $\sigma'_0 + \Delta\sigma > \sigma'_p = 2.508$ $C_{re} = 0.014$ $C_{ce} = 0.06$ $\sigma'_p = 2.508$ above WT										
	Depth Below Liner	σ'_0 TSF	$\Delta\sigma$ TSF	σ'_F TSF	σ'_{op} TSF	$\Delta\epsilon_{cr}$	$\Delta\epsilon_c$	h in	Δh in	$\Sigma\Delta h$ in
1	5	0.78	1.26	2.04	1.95	0.0056	0.0012	60	0.394	0.39
2	10	1.01	"	2.27	2.53	0.0049	-	"	0.295	0.68
3	15	1.18	"	2.44	2.95	0.0044	-	"	0.265	0.954
4	20	1.33	"	2.59	3.33	0.0041	-	"	0.243	1.197
5	25	1.48	"	2.74	3.70	0.0037	-	"	0.225	1.422
6	30	1.64	"	2.9	4.1	0.0035	-	"	0.208	1.63
7	35	1.80	"	3.06	4.5	0.0032	-	"	0.194	1.821
8	40	1.97	"	3.23	4.925	0.0030	-	"	0.180	2.001
9	45	2.11	"	3.37	5.275	0.0028	-	"	0.171	2.172
10	50	2.26	"	3.52	5.65	0.0026	-	"	0.162	2.33

PROJECT NO.	KLM
DATE	4/6/06

Settlement - Insitu Soils

H_{MSW} = 60 ft

$$\Delta\sigma = 63(60-10)/2000 = 1.575 \text{ tsf}$$

$$\sigma'_0 + \Delta\sigma < \sigma'_p \text{ (} C_r = 0.014 \text{)}, \sigma'_0 + \Delta\sigma > \sigma'_p = 2.5 \sigma'_0 \text{ (} C_c = 0.06 \text{)}$$

DEPTH BELOW LINER	σ'_0 tsf	$\Delta\sigma$ tsf	σ'_E tsf	σ'_p OCR = 2.5	ΔE_{cr}	ΔE_{cc}	h in	Δh in	$\Sigma \Delta h$ in
5	0.78	1.575	2.355	1.95	0.0056	0.0049	60	0.628	0.628
10	1.01	"	2.585	2.53	0.0056	0.0009	"	0.388	1.016
15	1.18	"	2.755	2.95	0.0052	—	"	0.309	1.325
20	1.33	"	2.905	3.325	0.0048	—	"	0.285	1.610
25	1.48	"	3.055	3.7	0.0044	—	"	0.264	1.874
30	1.64	"	3.215	4.1	0.0041	—	"	0.246	2.12
35	1.80	"	3.375	4.5	0.0038	—	"	0.229	2.34
40	1.97	"	3.545	4.925	0.0036	—	"	0.214	2.56
45	2.11	"	3.685	5.275	0.0034	—	"	0.203	2.76
50	2.26	"	3.835	5.65	0.0032	—	"	0.193	2.95

H_{MSW} = 70 ft

$$\Delta\sigma = 63(70-10)/2000 = 1.89 \text{ tsf}$$

5	0.78	1.89	2.67	1.95	0.0056	0.0081	60"	0.82	0.82
10	1.01	"	2.90	2.53	0.0056	0.0036	"	0.55	1.370
15	1.18	"	3.07	2.95	0.0056	0.0010	"	0.398	1.768
20	1.33	"	3.22	3.33	0.0054	—	"	0.323	2.091
25	1.48	"	3.37	3.70	0.005	—	"	0.300	2.391
30	1.64	"	3.53	4.10	0.0047	—	"	0.280	2.671
35	1.80	"	3.69	4.50	0.0044	—	"	0.262	2.933
40	1.97	"	3.86	4.93	0.0041	—	"	0.245	3.178
45	2.11	"	4.0	5.28	0.0039	—	"	0.233	3.411
50	2.26	"	4.15	5.65	0.0037	—	"	0.222	3.63

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4/6/06Settlement - Insitu soil $H_{MSW} = 80 \text{ ft}$

$$\Delta \sigma = 63(80-10)/2000 = 2.21 \text{ TSF}$$

$$\sigma_0 + \Delta \sigma < \sigma_p (C_f = 0.04), \sigma_0 + \Delta \sigma > \sigma_p = 2.5 \sigma_0 (C_f = 0.06)$$

Depth Below Liner	σ_0' TSF	$\Delta \sigma$ TSF	σ_F' TSF	σ_p' OCR = 2.5	Δe_{cr}	Δe_{cc}	h in	Δh in	$\Sigma \Delta h$ in
5	0.78	2.21	2.99	1.95	0.0056	0.0111	1.60	1.004	1.004
10	1.01	"	3.22	2.53	0.0056	0.0063	"	0.713	1.717
15	1.18	"	3.39	2.95	0.0056	0.0036	"	0.553	2.270
20	1.33	"	3.54	3.33	0.0056	0.0016	"	0.432	2.702
25	1.48	"	3.69	3.70	0.0056	—	"	0.336	3.038
30	1.64	"	3.85	4.10	0.0052	—	"	0.311	3.349
35	1.80	"	4.01	4.50	0.0049	—	"	0.292	3.641
40	1.97	"	4.18	4.93	0.0046	—	"	0.274	3.915
45	2.11	"	4.32	5.28	0.0044	—	"	0.261	4.176
50	2.26	"	4.47	5.65	0.0041	—	"	0.249	4.425

 $H_{MSW} = 90 \text{ ft}$

$$\Delta \sigma = 63(90-10)/2000 = 2.52 \text{ TSF}$$

5	0.78	2.52	3.30	> 1.95	0.0056	0.0137	60	1.152	1.159
10	1.01	"	3.53	> 2.53	0.0056	0.0087	"	0.857	2.016
15	1.18	"	3.70	> 2.95	0.0056	0.0059	"	0.690	2.706
20	1.33	"	3.85	> 3.33	0.0056	0.0038	"	0.563	3.269
25	1.48	"	4.00	> 3.70	0.0056	0.0020	"	0.458	3.727
30	1.64	"	4.16	≈ 4.10	0.0056	—	"	0.334	4.063
35	1.80	"	4.32	4.50	0.0053	—	"	0.318	4.381
40	1.97	"	4.49	4.93	0.0050	—	"	0.30	4.681
45	2.11	"	4.63	5.28	0.0048	—	"	0.288	4.969
50	2.26	"	4.78	5.65	0.0046	—	"	0.273	5.242

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4/6/06

Settlement - Insitu Soils

$H_{MSH} = 100 \text{ ft}$

$$\Delta\sigma = 63(100-10)/2000 = 2.835 \text{ TSF}$$

$$\sigma_0 + \Delta\sigma < \sigma_p \quad (C_{ve} = 0.014)$$

$$\sigma_0 + \Delta\sigma > \sigma_p \quad (C_e = 0.06) \quad OCR = 2.5$$

Depth Below LINER	σ_0' TSF	$\Delta\sigma$ TSF	σ_1' TSF	σ_p' TSF	Δe_{CR}	Δe_{CL}	h in	Δh in	$\Sigma \Delta h$ in
5	0.78	2.835	3.615 > 1.95		0.0056	0.0161	60	1.301	1.301
10	1.01	"	3.845 > 2.53		0.0056	0.0109	"	0.990	2.291
15	1.18	"	4.05 > 2.95		0.0056	0.0080	"	0.816	3.107
20	1.33	"	4.165 > 3.33		0.0056	0.0058	"	0.684	3.791
25	1.48	"	4.315 > 3.70		0.0056	0.0040	"	0.576	4.367
30	1.64	"	4.475 > 4.10		0.0056	0.0023	"	0.473	4.840
35	1.80	"	4.635 > 4.50		0.0056	0.0007	"	0.382	5.222
40	1.97	"	4.805 > 4.93		0.0054	—	"	0.325	5.547
45	2.11	"	4.945 > 5.28		0.0052	—	"	0.311	5.858
50	2.26	"	5.095 > 5.65		0.0049	—	"	0.297	6.155

$H_{MSH} = 110 \text{ ft}$

$$\Delta\sigma = 63(110-10)/2000 = 3.15 \text{ TSF}$$

5	0.78	3.15	3.93 > 1.95		0.0056	0.0183	60	1.432	1.432
10	1.01	"	4.16 > 2.53		0.0056	0.0130	"	1.114	2.546
15	1.18	"	4.39 > 2.95		0.0056	0.0104	"	0.958	3.504
20	1.33	"	4.48 > 3.33		0.0056	0.0077	"	0.800	4.304
25	1.48	"	4.63 > 3.70		0.0056	0.0058	"	0.687	4.991
30	1.64	"	4.79 > 4.10		0.0056	0.0041	"	0.579	5.570
35	1.80	"	4.95 > 4.50		0.0056	0.0025	"	0.485	6.055
40	1.97	"	5.12 > 4.93		0.0056	0.0010	"	0.395	6.450
45	2.11	"	5.26 > 5.28		0.0056	—	"	0.336	6.786
50	2.26	"	5.41 > 5.65		0.0053	—	"	0.318	7.104

KLM
4/6/06

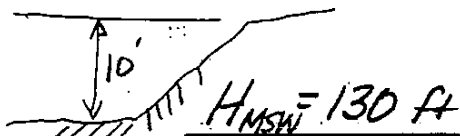
Settlement - insitu soils

$H_{MSW} = 120 \text{ ft}$

$$\Delta\sigma = 63(120-10)/2000 = 3.465 \text{ TSF}$$

$$\sigma'_0 + \Delta\sigma \leq \sigma'_p (C_{re} = 0.014); \sigma'_0 + \Delta\sigma > \sigma'_p (C_{re} = 0.06) \text{ OCR} = 2.5$$

Depth Below LINER	σ'_0 TSF	$\Delta\sigma$ TSF	σ'_f TSF	σ'_p OCR=2.5	Δe_{cr}	Δe_{c_c}	h in	Δh in	$\Sigma \Delta h$ in
5	0.78	3.465	4.245 > 1.95		0.0056	0.0203	60	1.552	1.552
10	1.01	"	4.475 > 2.53		0.0056	0.0149	"	1.278	2.780
15	1.18	"	4.645 > 2.95		0.0056	0.0118	"	1.046	3.826
20	1.33	"	4.795 > 3.33		0.0056	0.0095	"	0.906	4.732
25	1.48	"	4.945 > 3.70		0.0056	0.0076	"	0.789	5.521
30	1.64	"	5.105 > 4.10		0.0056	0.0057	"	0.679	6.200
35	1.80	"	5.265 > 4.50		0.0056	0.0041	"	0.581	6.781
40	1.97	"	5.435 > 4.93		0.0056	0.0025	"	0.488	7.269
45	2.11	"	5.575 > 5.28		0.0056	0.0014	"	0.421	7.690
50	2.26	"	5.725 > 5.65		0.0056	0.0003	"	0.357	8.047



$$\Delta\sigma = 63(130-10)/2000 = 3.78 \text{ TSF}$$

OCR = 2.5

2.5 *	5	0.78	3.78	4.56 > 1.95	0.0056	0.02214	60	1.664	1.664
7.5 *	10	1.01	"	4.79 > 2.53	0.0056	0.0166	"	1.934	2.998
12.5 *	15	1.18	"	4.96 > 2.95	0.0056	0.0135	"	1.148	4.146
17.5 *	20	1.33	"	5.11 > 3.33	0.0056	0.0112	"	1.006	5.152
22.5 *	25	1.48	"	5.26 > 3.70	0.0056	0.0092	"	0.886	6.038
27.5 *	30	1.64	"	5.42 > 4.10	0.0056	0.0072	"	0.772	6.810
	35	1.80	"	5.58 > 4.50	0.0056	0.0056	"	0.672	7.482
	40	1.97	"	5.75 > 4.93	0.0056	0.0040	"	0.577	8.059
	45	2.11	"	5.89 > 5.28	0.0056	0.0028	"	0.507	8.566
	50	2.26	"	6.04 > 5.65	0.0056	0.0017	"	0.440	9.006

PROJECT NO. **KLM**
DATE **4/6/06**

Settlement in Natural Soil

DEPTH BELOW LINER	HMSW	Σh in	Σh_{RBD}	SETTLE $\Delta h + \Delta h_{RBD}$	HMSW	Σh in	Σh_{RBD}	SETTLE $\Delta h + \Delta h_{RBD}$
5	20'	0.124	0.60	0.724	60	0.628	0.60	1.228
10		0.223	0.91	1.133		1.016	0.91	1.926
15		0.309	1.13	1.439		1.325	1.13	2.455
20		0.387	1.30	1.687		1.610	1.30	2.91
25		0.457	1.43	1.887		1.874	1.43	3.304
30		0.521	1.54	2.061		2.12	1.54	3.66
35		0.58	1.64	2.22		2.349	1.64	3.989
40		0.634	1.73	2.364		2.563	1.73	4.293
45	30	0.685	1.81	2.495	70	2.766	1.81	4.576
50		0.733	1.88	2.613		2.959	1.88	4.839
5		0.22	0.60	0.82		0.82	0.60	1.42
10		0.40	0.91	1.31		1.372	0.91	2.282
15		0.556	1.13	1.686		1.768	1.13	2.898
20		0.697	1.30	1.997		2.091	1.30	3.391
25		0.83	1.43	2.26		2.391	1.43	3.821
30		0.95	1.54	2.49		2.671	1.54	4.211
35	40	1.05	1.64	2.69	80	2.933	1.64	4.573
40		1.15	1.73	2.88		3.178	1.73	4.908
45		1.25	1.81	3.06		3.411	1.81	5.221
50		1.34	1.88	3.22		3.632	1.88	5.512
5		0.288	0.60	0.888		1.004	0.60	1.604
10		0.528	0.91	1.438		1.717	0.91	2.627
15		0.744	1.13	1.874		2.270	1.13	3.40
20		0.940	1.30	2.24		2.702	1.30	4.002
25	50	1.120	1.43	2.55	90	3.038	1.43	4.468
30		1.286	1.54	2.826		3.349	1.54	4.889
35		1.44	1.64	3.08		3.641	1.64	5.281
40		1.583	1.73	3.313		3.915	1.73	5.645
45		1.718	1.81	3.528		4.176	1.81	5.986
50		1.842	1.88	3.722		4.425	1.88	6.305
5		0.394	0.60	0.994		1.159	0.60	1.759
10		0.689	0.91	1.599		2.016	0.91	2.926
15	60	0.954	1.13	2.084	100	2.706	1.13	3.836
20		1.197	1.30	2.497		3.269	1.30	4.569
25		1.422	1.43	2.852		3.727	1.43	5.157
30		1.63	1.54	3.17		4.063	1.54	5.603
35		1.824	1.64	3.464		4.381	1.64	6.021
40		2.004	1.73	3.734		4.681	1.73	6.411
45		2.175	1.81	3.985		4.969	1.81	6.779
50		2.337	1.88	4.217		5.242	1.88	7.122

KLM

4/7/06

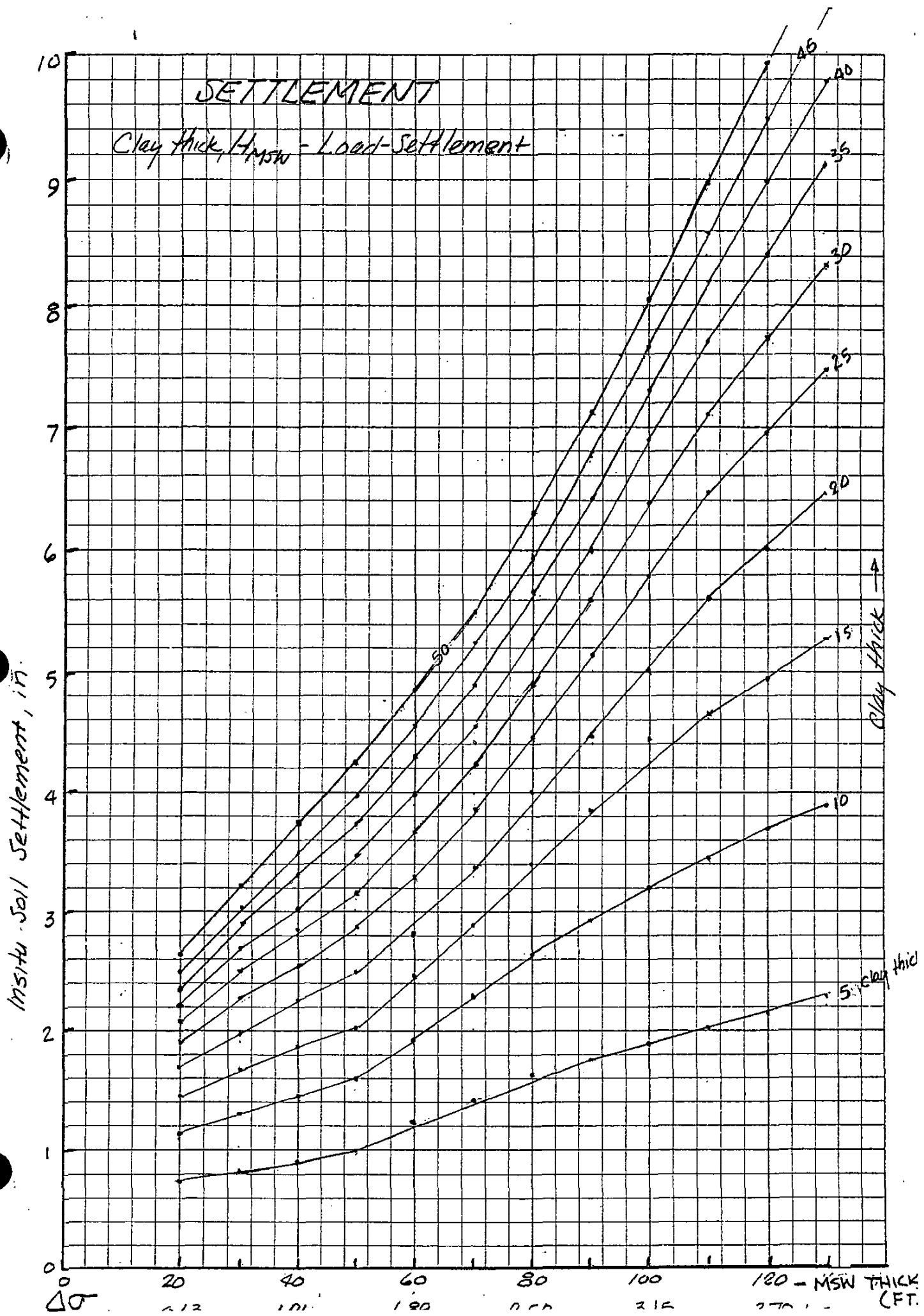
Settlement in natural Soil

Depth Below Liner	HMSW	$\Sigma \Delta h$ in	$\Sigma \Delta h_{RBD}$ in	SETTLE $\Delta h + \Delta h_{RBD}$
5	100'	1.301	0.60	1.901
10		2.291	0.91	3.201
15		3.107	1.13	4.237
20		3.791	1.30	5.091
25		4.367	1.43	5.797
30		4.840	1.54	6.38
35		5.222	1.64	6.862
40		5.547	1.73	7.277
45		5.858	1.81	7.668
50		6.155	1.88	8.035

5	110'	1.432	0.60	2.032
10		2.506	0.91	3.456
15		3.504	1.13	4.634
20		4.304	1.30	5.604
25		4.991	1.43	6.421
30		5.570	1.54	7.11
35		6.055	1.64	7.695
40		6.430	1.73	8.18
45		6.786	1.81	8.596
50		7.104	1.88	8.984

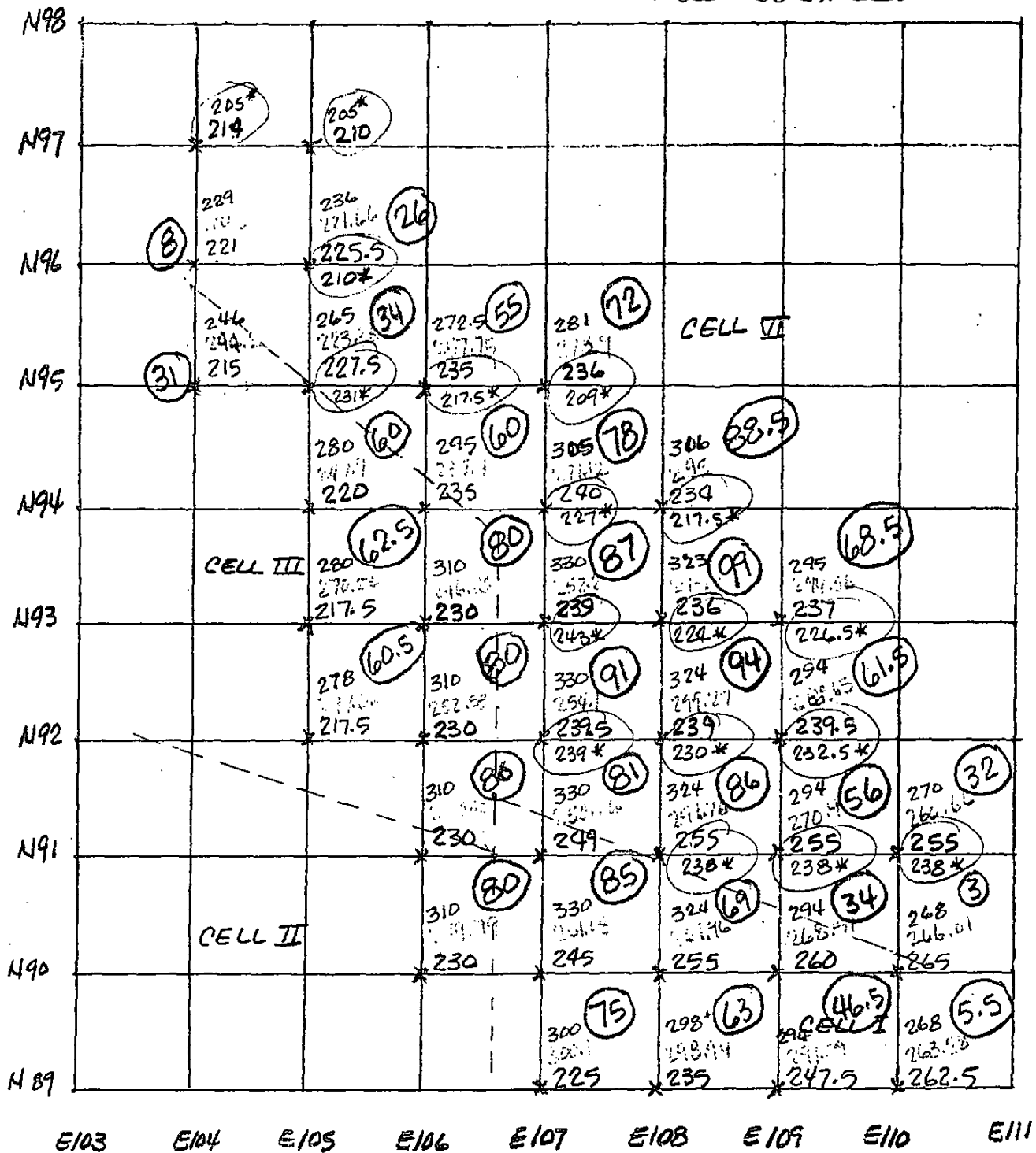
5	120'	1.552	0.60	2.152
10		2.780	0.91	3.69
15		3.826	1.13	4.956
20		4.732	1.30	6.032
25		5.521	1.43	6.951
30		6.200	1.54	7.74
35		6.781	1.64	8.421
40		7.269	1.73	8.999
45		7.690	1.81	9.5
50		8.047	1.88	9.927

5	130'	1.664	0.60	2.264
10		2.998	0.91	3.908
15		4.146	1.13	5.276
20		5.152	1.30	6.452
25		6.038	1.43	7.468
30		6.810	1.54	8.35
35		7.482	1.64	9.122
40		8.059	1.73	9.789
45		8.566	1.81	10.376
50		9.006	1.88	10.886



MUNDY LANDFILL
KLM 3/15/06
EXCAVATED
ELEVATIONS

CELL BOTT ELEV EST \Rightarrow REF DSW-GP-1
CELL CAP ELEV, & Point of Entry, etc.
PROPOSED C & D CAP ELEV

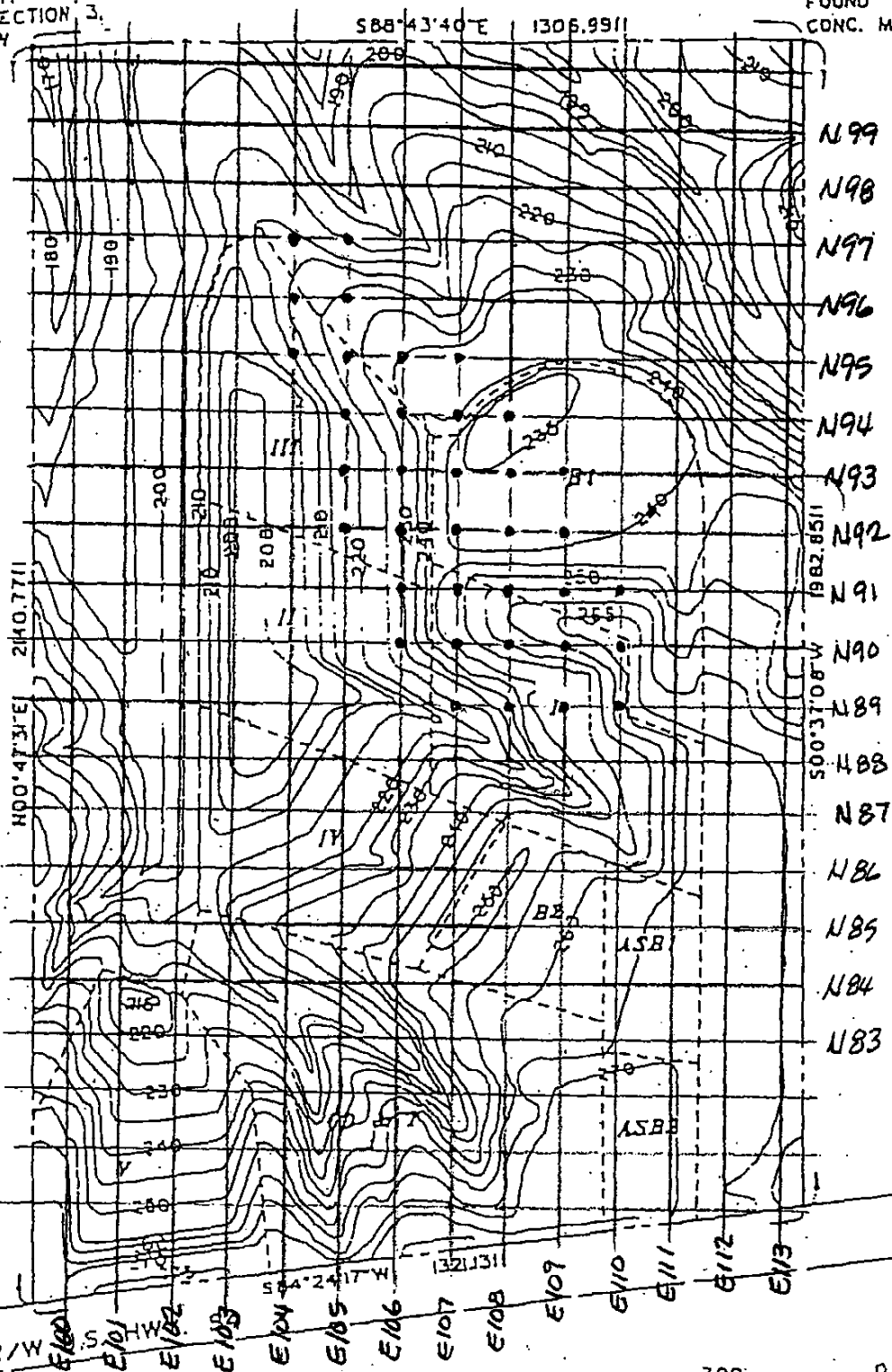


Numbers followed by * are corrected values
from AFJM Shts 40 and 41 of 50
March 1997 -

○ - HMSW, height of MSW

FOUND
CONC. MNT.
B NWC SECTION 3,
T12N, R12W

FOUND
CONC. MNT.



NOTE:
ALL INFORMATION SHOWN
TAKEN FROM HISTORICAL FILES
FOR MUNDOY SANITARY LANDFILL
IS PROVIDED BY DESOTO PARISH
LICE JURY & LOUISIANA DEPT.
ENVIRONMENTAL QUALITY



GRAPHIC SCALE : 1" = 300'

DSW-GP-25.

ESTIMATED CELL EXCAVATION TOPOGRAPHY

Bott Elev

Cell VI

Reference

N97, E104	205
, E105	205
N96, E104	227 - CLE
E105	210
N95, E105	231
E106	217.5
E107	209 -
N94, E107	227 -
E108	217.5 -
N93, E107	243
E108	224
E109	226.5
N92, E107	239
E108	230
E109	232.5
N91, E108	238 -
E109	238
E110	238

Waste Disposal Layout Grith

North & South SHT 40#47
8851

Pillet, Fenner, Jolly & McClelland, Inc
March 97

B1	{ N96+35 E103+81	221
B119	{ N97+00 E104+00	205
B2	{ N96+42 E107+16	200.75

B4

B5	{ N92+85 E106+92	246 -?
B117	{ N92+50 E108+60	227
B17	{ N92+85 E109+01	227.5
B6	{ N93+11 E109+08	226
B116	{ N92+50 E111+00	230

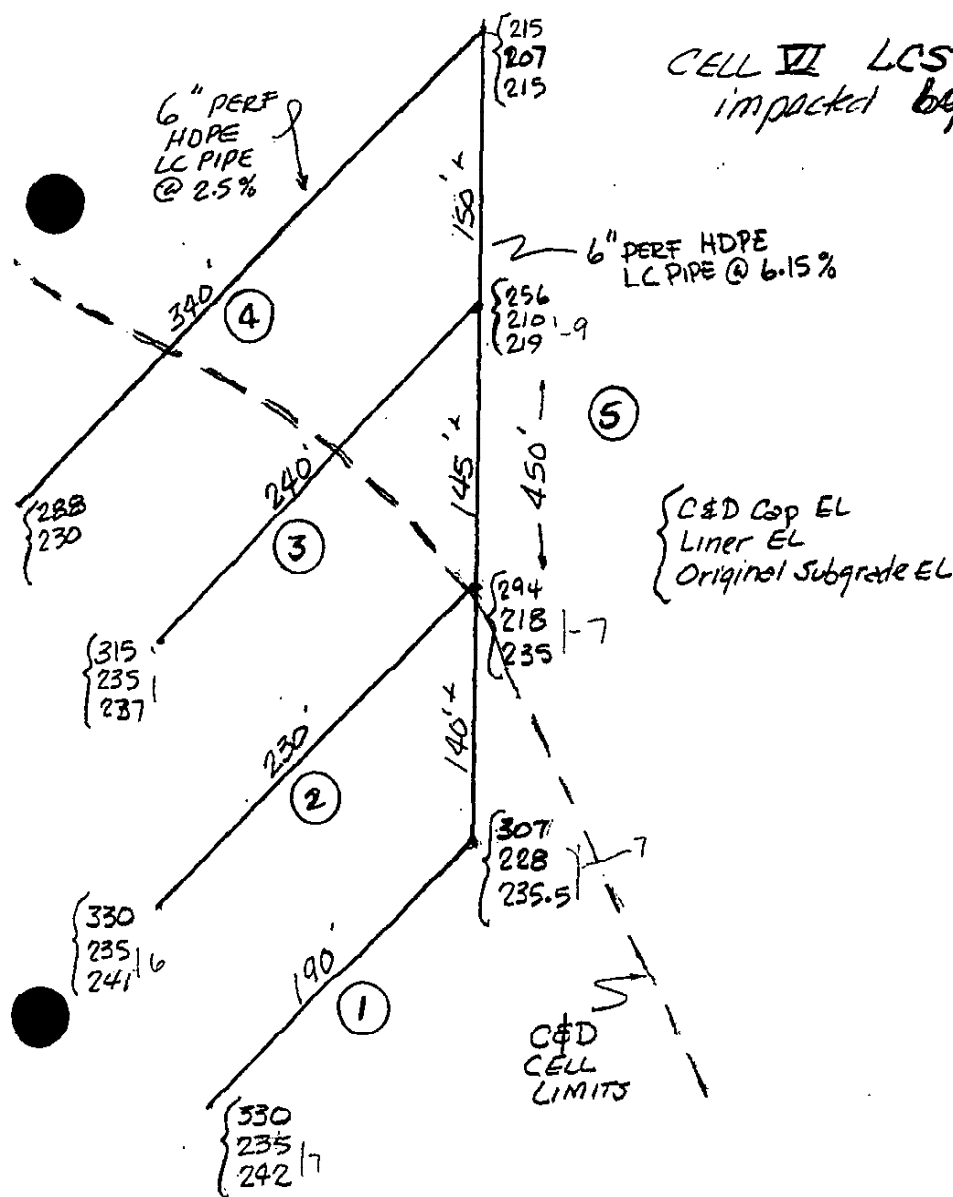
DESIGNED BY	KLM
DATE	4/12/06

Settlement of in situ Soil

The compressibility tests from Boring No 16 was used. C1 from the 8'-10' depth was selected based on the more complete series of loading and unloading. Most of the soil beneath the proposed C&D cell consists of thick, very stiff clays with thinner sand lenses dispersed at various depths. The most significant sand layer (soil C) exists on the Southeast fringe of C&D valley cell. The clays extend to great depths.

Using the settlement curves generated for different heights of MSW (upon assumed +/- 10 ft excavation) and the measured H_{MSW} values at the intersection of coordinates, the following settlement are obtained (Clay thick = 50' used)

	SETTLEMENT (IN.)							
	E104	E105	E106	E107	E108	E109	E110	E111
N97+00	-	-						
N96+00	-	3.0"						
N95+00	3.25"	3.4"	4.6"	5.4"				
N94+00		4.8"	4.8"	6.1"	3.7"			
N93+00		5.0"	6.3"	6.9"	8.0"	5.4"		
N92+00		4.9"	6.3"	7.1"	7.5"	5.0"		
N91+00	-		6.3"	6.35"	6.8"	4.6"	3.3	
N90+00			6.3"	6.7"	5.4	3.4"	-	
N89+00				5.9"	5.0"	4.1"	-	



CELL VII LCS
impacted by C&D cell

4/12/06
KIM

SETTLEMENT
INSITU SOILS
L.C.S. effect

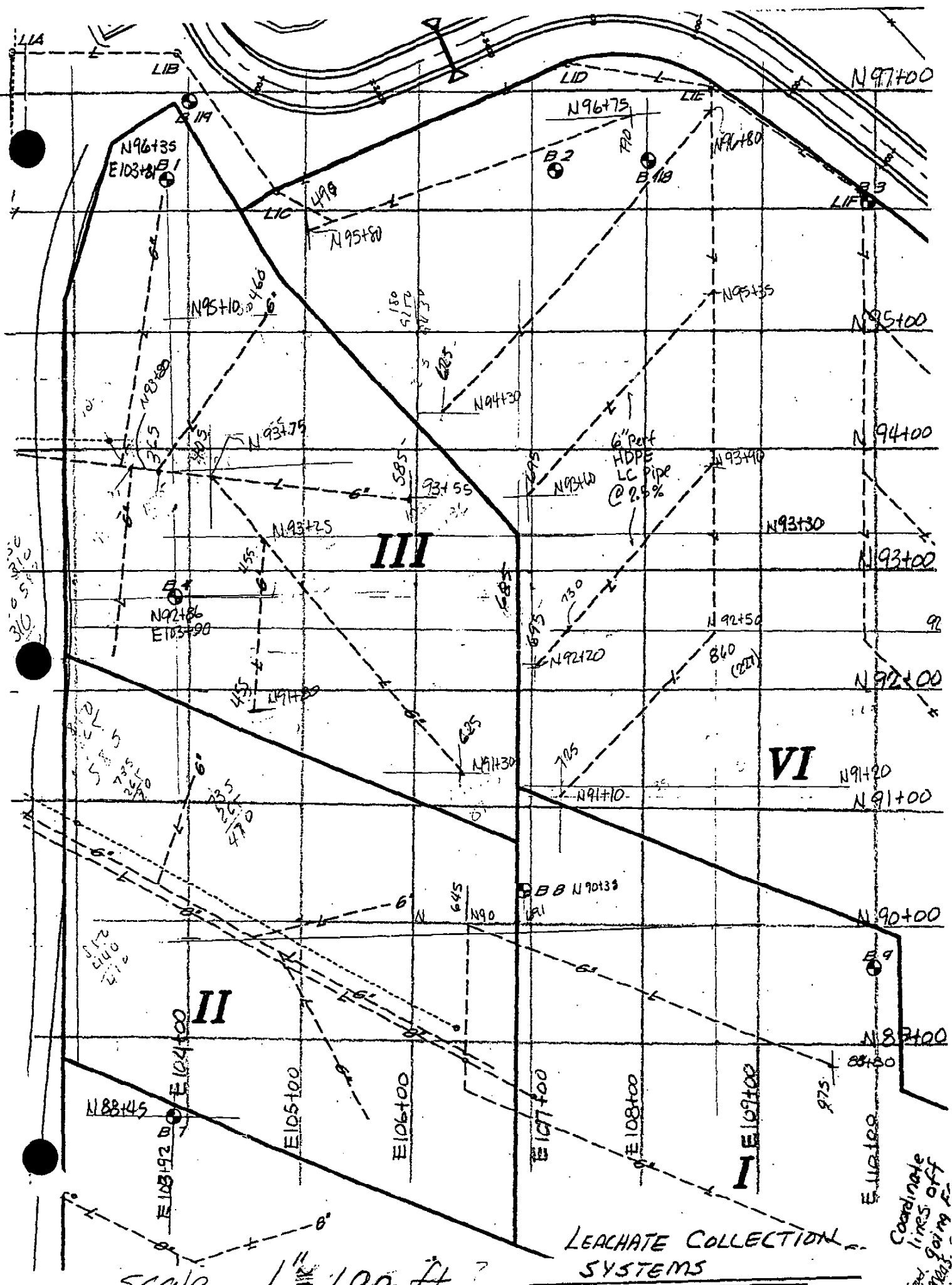
Settlement estimates for the above on following pages.

Max diff settlement between L.C. pipe sections

$$\text{Diff } \textcircled{1} = \frac{8.0 - 5.9}{105' \times 12} = \frac{2.1}{1260} = 0.0016 \text{ or } \underline{0.16\% \text{ change in slope}}$$

$$\text{Diff } \textcircled{2} = \frac{9.0 - 6.0}{120' \times 12} = 0.0021 \text{ or } \underline{0.2\% \text{ change in slope}}$$

Slope changes will not affect
drainage of LCS.



Scale 1" = 100 ft

LEACHATE COLLECTION SYSTEMS

Coordinate lines off 1/2" going E



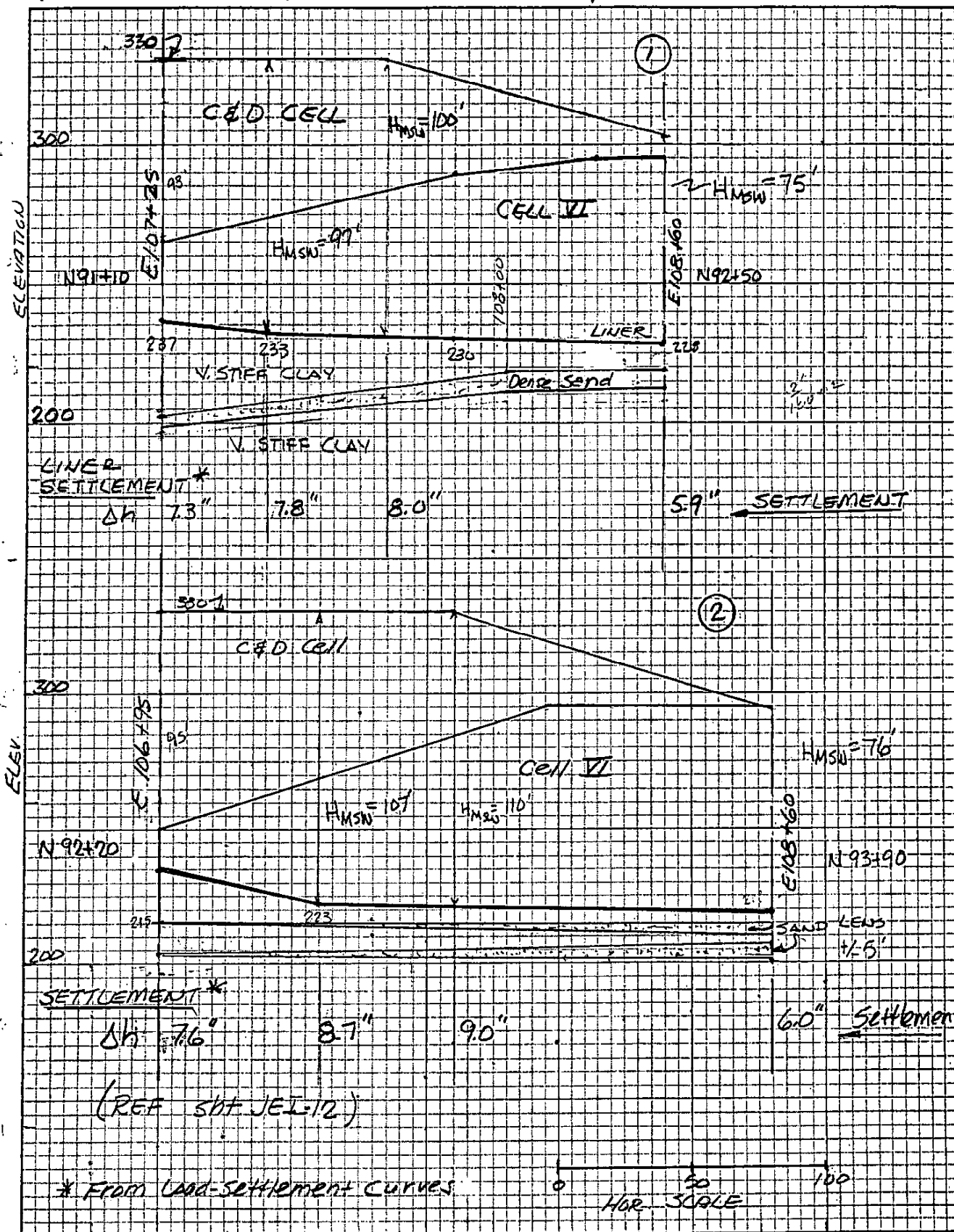
STE

Soil Testing Engineers, Inc.

316 Highlandia Drive • P. O. Box 83710
Baton Rouge, Louisiana 70884

Telephone (225) 752-4790
FAX (225) 752-4878

Project: Mundy C&D Landfill Client: _____ Job #: _____
By: KLM Checked by: _____ Date: 4/11/06 Sheet _____ of _____





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Project: Muddy C&D Cell

Client: _____

Job #: _____

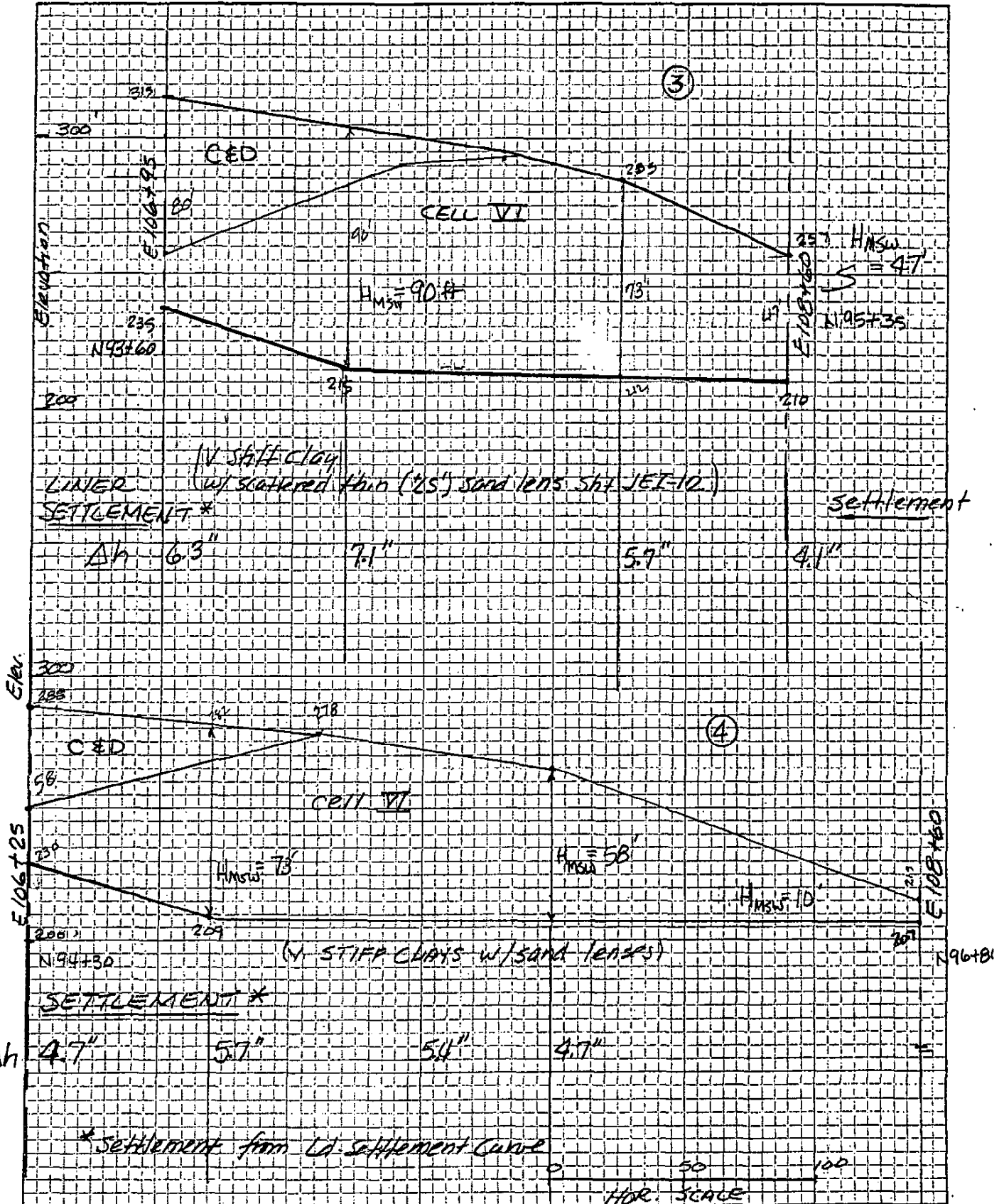
By: KLM

Checked by: _____

Date: 4/12/06

Sheet _____

of _____





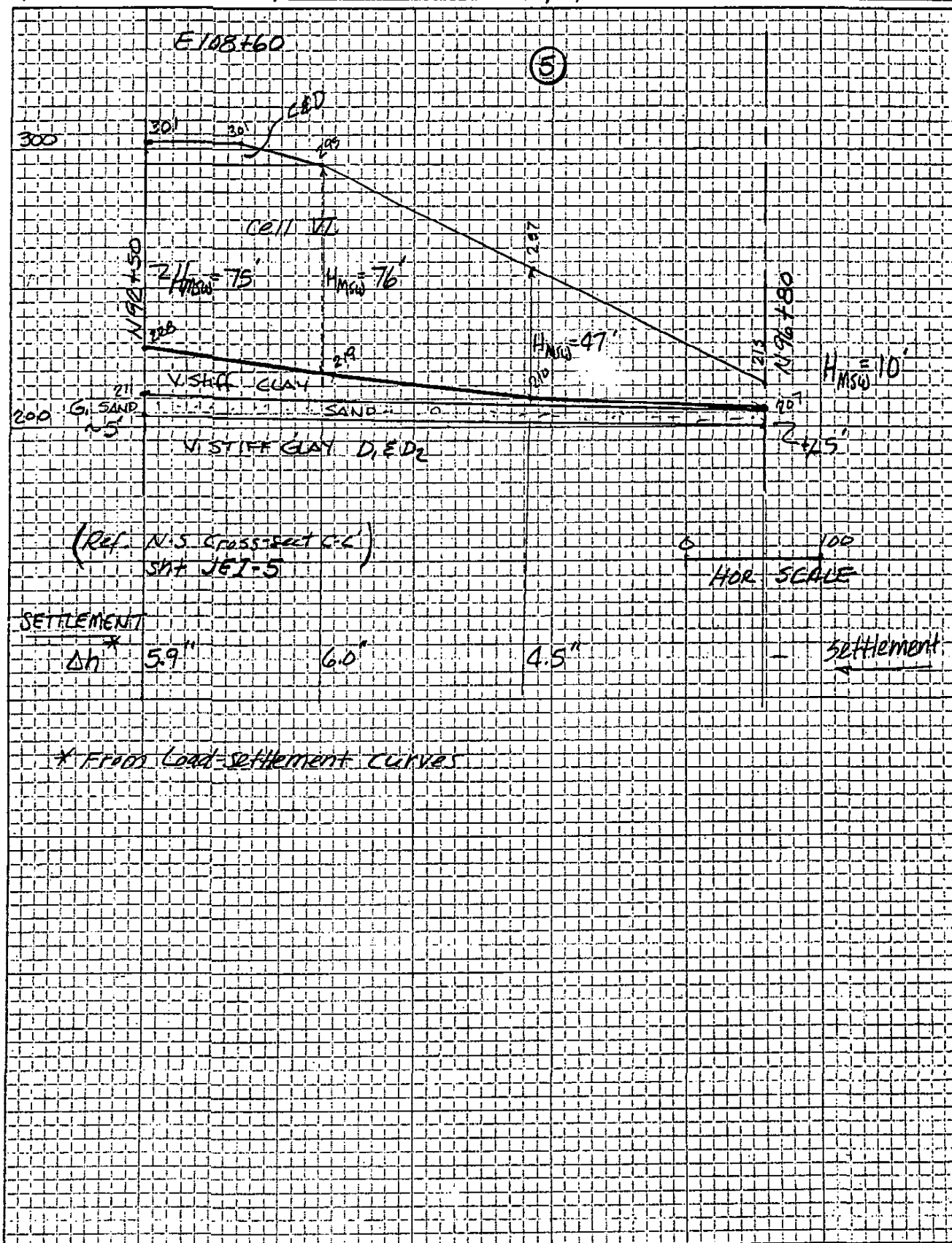
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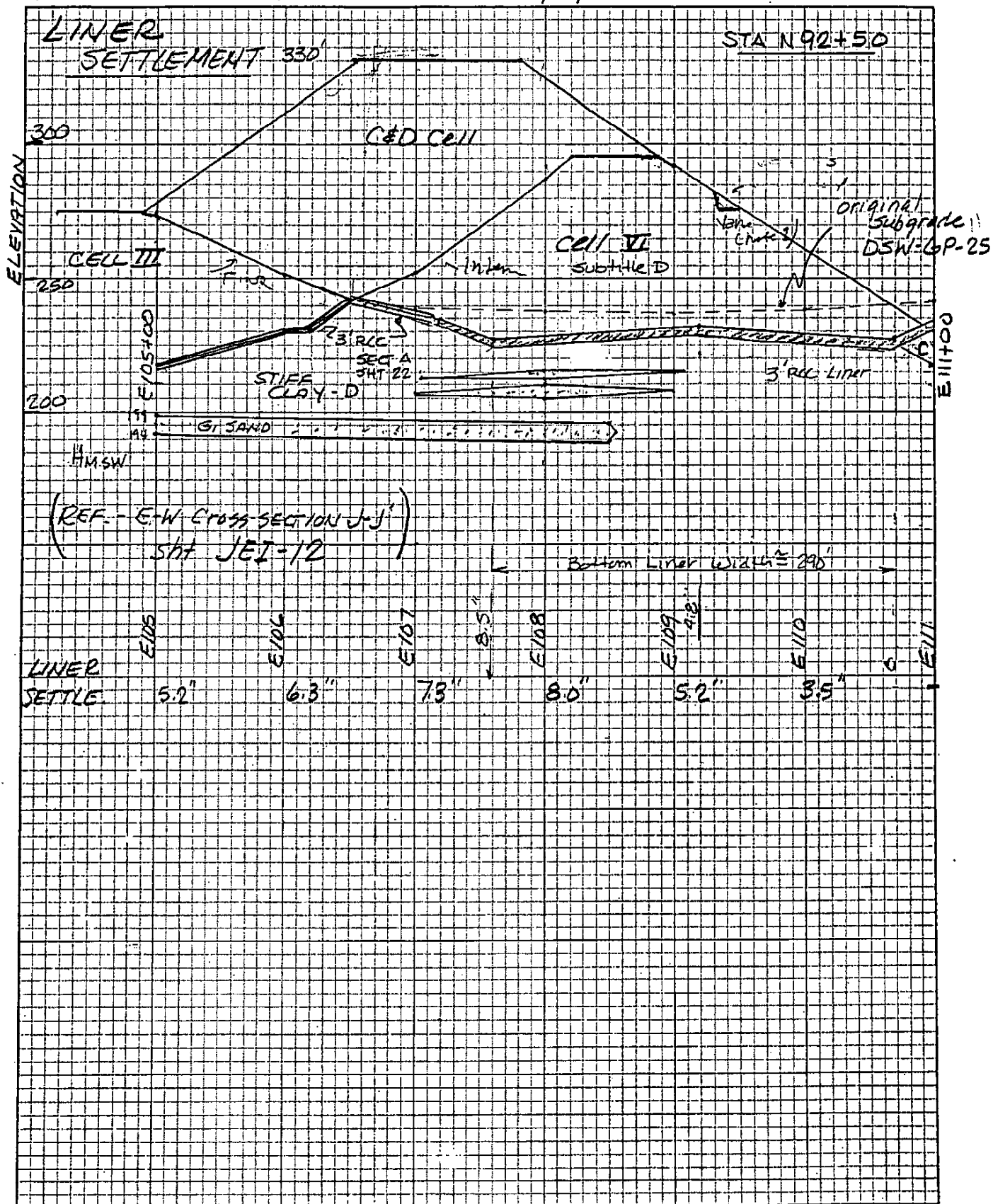
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By: KLM Checked by: _____ Date: 4/12/06 Sheet _____ of _____



KLM
4/13/06

Liner / Foundation Settlement

Bending & Elongation Strains

Ref.
(Boutwell & Fiore, 1995)

Bending Strain: $\epsilon_b = 6TS/B^2$ (plate theory)

Elongation Strain $\epsilon_e = \sqrt{2} [(2R/B) \sin^{-1}(B/2R) - 1]$

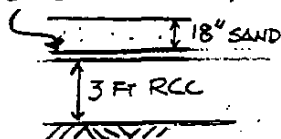
Where T = liner thickness =

S = DIFF settlement between pts B apart

B = Dist. (typically, liner width)

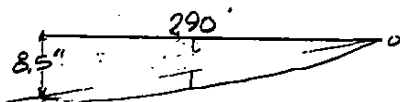
R = radius of bending

Cushion Geotextile &
60 MIL HDPE Geosynthetic



CELL VII Liner

Consider Cell VII Sta 92+50



Bending Strain

$$\epsilon_b = 6(3 \times \frac{8.5}{12}) / 290^2 = 1.5 \times 10^{-4}$$

Elongation Strain

$$R = B^2/S + S/2 = (290)^2 / (8 \times \frac{8.5}{12}) + \frac{8.5}{(12)(2)}$$

$$= 14841.2 + 0.35$$

$$= 14841.55$$

$$\epsilon_e = \sqrt{2} \left[\left(\frac{2(14841.55)}{290} \right) \sin^{-1} \left(\frac{290}{2(14841.55)} \right) - 1 \right]$$

$$= 1.44 [(102.4)(0.0097) - 1]$$

$$= 1.004505 - 1 = 4.5 \times 10^{-3}$$

Total Strain $\epsilon_T = \epsilon_b + \epsilon_e = 0.00015 + 0.0045$

$\epsilon_T = 0.0047 < 1\%$ \therefore O.K. no tensile cracking
Murphy & Gilbert (1985)

Stress Criterion

Clay Liner

$$\sigma_{ht} = E \epsilon_T < K_o \sigma = \sigma_{hc}$$

$$(20,000)(0.0046) < (\frac{1}{2})(105 \times 63)$$

$92 < 33075$ O.K. no net tens.

Synthetic Components

assume $E_{HDPE} = 100$ ksi

$$\sigma_T = \epsilon_e$$

$$\sigma_{ht} = \epsilon_e E_{HDPE} = (4.5 \times 10^{-3})(100 \times 10^3) = 450 \text{ psi}$$

$$< 2000 \text{ psi} \quad F.O.S. = 4.4 \quad \underline{\underline{O.K.}}$$

KLM
4/14/06

Settlement under time-dependent load

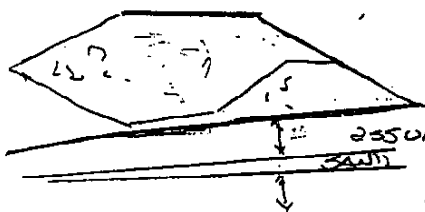
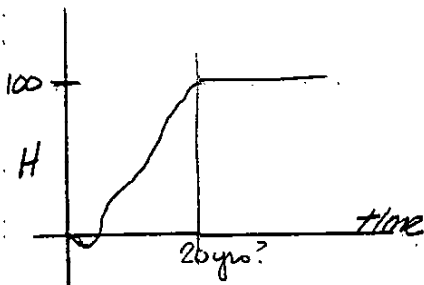
Ref. Olson, 1977

$$\Delta \sigma = (330 - 230)(63) - (120)(10) = 5600 \text{ psf}$$

Using Consolidation results from B309

Sample depth @ 17' $\cdot \sigma_0 + \Delta \sigma = 2100 + 5600 = 7700 \text{ psf} = 3.85 \text{ tsf}$

from test curve $\cdot C_v \approx 0.1$



$$T_c = \frac{C_v t}{H_d^2}$$

$$= \frac{(0.1)(20 \times 365)}{10^2} = 7.3 \Rightarrow U = 95\%$$

t_c	T_c	U_c
5	1.8	22%
10	3.7	
15	5.5	
20	7.3	95%

area consists of
thick clays within
sand seams -

assume $H_d = 20$

$$T_c = \frac{(0.1)(20 \times 365)}{(20)^2}$$

$$= 1.8 \Rightarrow U = 90\%$$

40% - 95% insitu settlement

estimated complete when

fill completed -

assume $H_d = 50$

$$T_c = \frac{(0.1)(20 \times 365)}{(50)^2}$$

$$= 0.29 \Rightarrow U = 42\%$$

Use $U = 90\%$ settlement
with completion of fill

*Mundy Landfill
Modification No. 2*

APPENDIX T-1d

Soil Loss Calculations

Mundy Landfill - CD&T-N Cell

5/14/06

EROSION CONTROL - Universal Soil Loss Eq

KLM

Calculation of the average soil loss in tons per acre per year for the final cover design -

Universal Soil Loss Equation:

$$A = R \cdot K \cdot L_s \cdot C \cdot P$$

Where A = ave annual soil loss (tons/acre/year)

R = rainfall/runoff erosivity (Fig 2)

$$R = 350$$

K = Soil Erodibility Factor (tons/acre) - (Table 2)

$$K = 0.23 \text{ (silty clay, 2\% organics)}$$

C = cover management factor (Table 2)

$$C = 0.003 \text{ (95\% cover; no appreciable canopy)}$$

L_s = slope length factor (Figure 3) slopes & lengths vary

$$L_s = 16 \text{ (430 ft, 30\%)} \text{ max possibility}$$

P = Conservation Practice Factor (Table 3)

$$P = 1 \text{ (Land slope } \approx 30\% > 24\%)$$

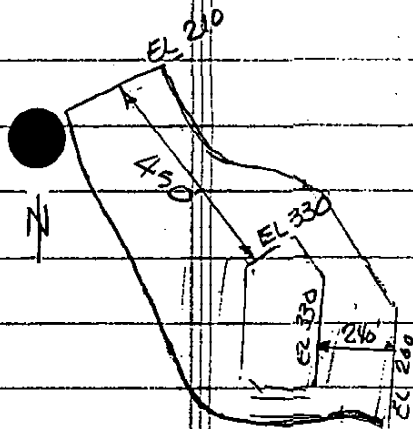
$$A = (350)(0.23)(16)(0.003)(1)$$

$$= 3.86 \text{ tons/acre/year } \underline{\underline{O.K.}}$$

compatible w/ max
tolerance values (between
2-5 tons/acre/yr) *

* Ref. 1. Maidment, David R., Handbook of
Hydrology, 1993

2. TNRC, Use of the Universal Soil
Loss Equation in Final Cover /
Configuration Design, 1993



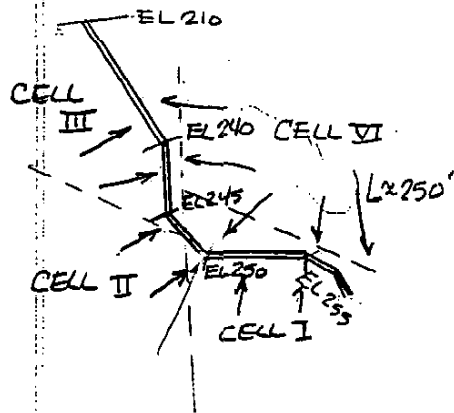
*Mundy Landfill
Modification No. 2*

APPENDIX T-1e
Pipe Size/Deflection

DRAINAGE FOR WASTE-CONTACT STORMWATER
MUNDY CDW-N - DeSoto Parish

5/7/06
KLM

DRAINAGE VIA PIPE ON VALLEY FLOOR BETWEEN
CELLS I, II, III & VI.



REF. LaDOTD HYDRAULICS MANUAL
www.dotd.louisiana.gov
Chapt. 2 - Urban Drainage Design
Rational Eq w/ 10yr storm

Time of Concentration - East-West Section

① T_{C1} = from Cell VI crest to pipe

② T_{C2} = from West end of pipe to Cell I & II intersection

$$\begin{aligned} \textcircled{1} \quad T_{C1} &= 0.7039 (L^{0.3917} \times C^{-1.1309} \times S^{-0.1985}) \\ &= 0.7039 (250^{0.3917}) (0.25^{-1.1309} \times 30^{-0.1985}) \\ &= (0.7039) (8.695) (4.796) (0.509) \\ &= 14.94 \text{ min} \end{aligned}$$

L = length, FT
C = coef runoff
S = slope, %
 T_C = min

② assume 10" ϕ flowing full, Mannings Eq

$$V = \frac{1.49}{n} R^{2/3} S^{1/2}$$

Where $n = 0.015$

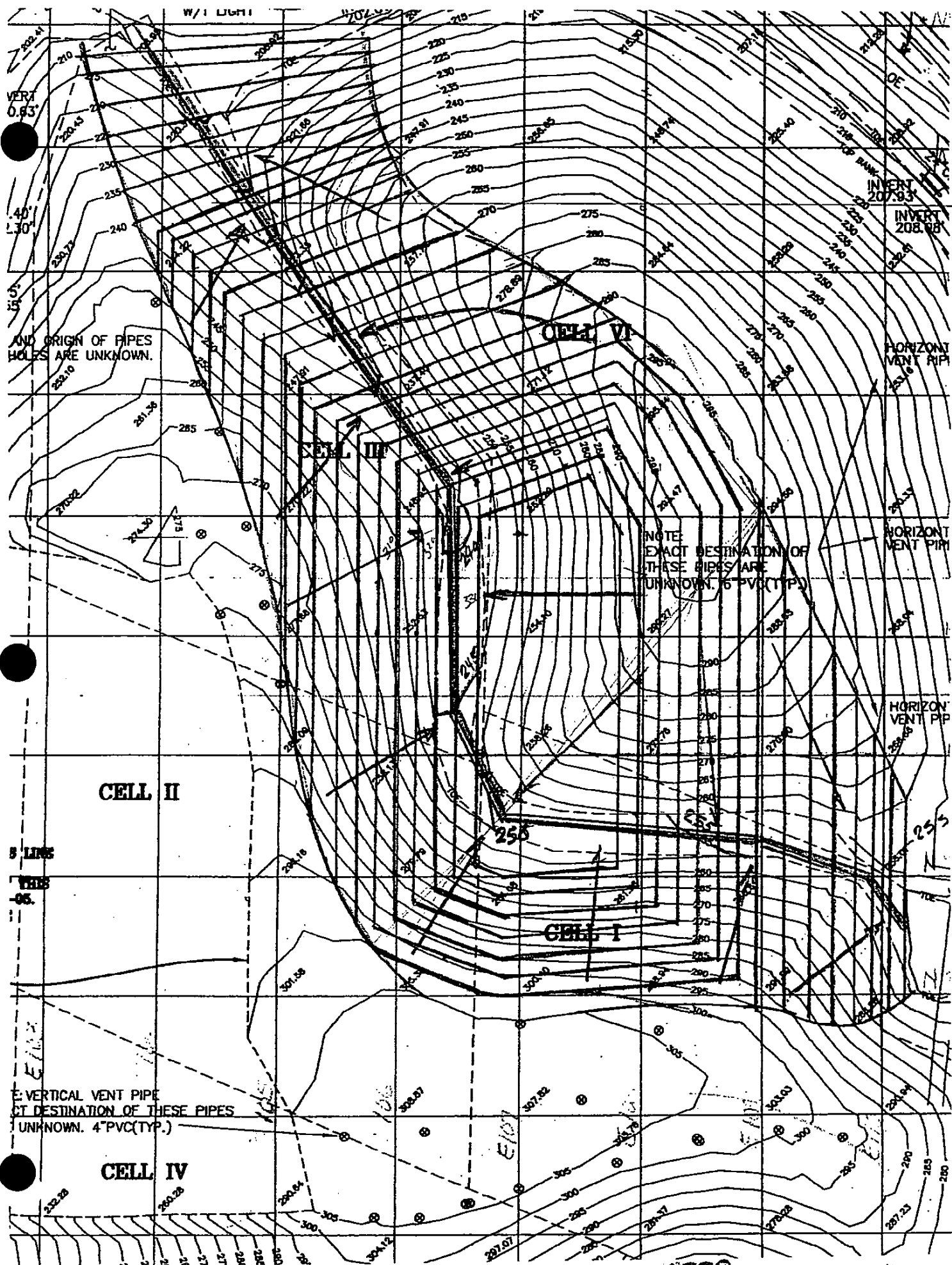
$$R = \frac{A}{P} = \frac{\pi \left(\frac{10}{2}\right)^2}{(4)(\pi)\left(\frac{10}{2}\right)} = 0.21$$

$$S = \frac{255 - 250}{200} = 0.025$$

$$\begin{aligned} V &= \frac{1.49}{0.015} \left(\frac{0.21}{0.319} \right)^{2/3} \left(\frac{0.025}{0.158} \right)^{1/2} \\ &= 5.50 \text{ FT/sec} \end{aligned}$$

$$\begin{aligned} T_{C2} &= \frac{L}{60V} \\ &= \frac{200}{(60)(5.5)} \\ &= 0.61 \text{ min} \end{aligned}$$

$$T_C = T_{C1} + T_{C2} = 14.94 + 0.61 = 15.55 \text{ min}$$



Waste-Contact Stormwater Drainage
Mundy CDW-N

5/7/06
KLM

Rainfall Intensity (1st Sect) -

Region III - 10 yr frequency - LADOTD IDF curves

$$I = a(D+b)^c$$

$$I = (3.086) \left(\left(\frac{15.55}{60} \right) + 0.231 \right)^{0.826}$$

$$= 5.56 \text{ in/hr}$$

RATIONAL EQUATION

$$Q = CIA$$

$$= (0.25)(5.56) \left(\frac{760}{3} \right)$$

$$= 3.24 \text{ cfs}$$

Mannings Eq

$$D_p = \left(2.48 Q n / S^{1/2} \right)^{3/8}$$

$$= \left[(2.48)(3.24 \text{ cfs}) / (0.015)^{1/2} \right]^{3/8}$$

$$= 0.86 \text{ ft} = 10.3" \text{ SAY } 10" \phi$$

N-S section between Cell III & Cell VI : (assume 12" ϕ flowing full)

$$S = \frac{250 - 240}{290} = 0.0345$$

$$V = \frac{1.49}{0.015} \left(\frac{\pi (12)^2}{4 \pi (12)} \right)^{2/3} (0.0345)^{1/2}$$

$$= 7.32 \text{ ft/sec}$$

$$T_c = \frac{290}{(60)(7.32)} = 0.66 \text{ min}$$

$$T_{cT} = 15.55 + 0.66 = 16.21 \text{ min}$$

$$I = (3.086) \left(\left(\frac{16.21}{60} \right) + 0.231 \right)^{0.826} = 5.46 \text{ in/hr}$$

use 5.56 in/hr

$$Q = CIA = (0.25)(5.56) \left(\frac{2}{3} \times 7 \right) = 6.52 \text{ cfs}$$

$$D_p = \left[(2.48)(6.52) / (0.015)^{1/2} \right]^{3/8} = 1.05 \text{ ft} = 12.6" \phi$$

USE 12" ϕ

Waste-Contact Stormwater Drainage Mundy CDW-N

N-NW Section between Cells III & VI - assume 12" ϕ
flowing full

$$S = \frac{240 - 210}{440}$$

$$= 0.068$$

$$V = \frac{1.49}{0.015} \left(\frac{\pi (12)^2}{4 \pi \frac{12}{12}} \right)^{2/3} (0.068)^{1/2}$$

.375 .261

$$= 9.7 \text{ ft/sec}$$

$$T_c = \frac{440}{(60)(9.7)} = 0.75 \text{ min}$$

$$T_T = 16.21 + 0.75 = 16.97 \text{ min}$$

$$I = (3.086) \left(\frac{16.97}{60} + 0.231 \right)^{-0.822}$$

$$= 5.36 \text{ in/hr} \quad \text{use } 5.56 \text{ in/hr}$$

$$Q = CIA = (0.25)(5.56)(7)$$

$$= 9.73 \text{ cfs}$$

$$D_p = \left[(2.16)(9.73)(0.015)(0.068)^{1/2} \right]^{3/8}$$

$$= 1.07 \text{ ft} = 12.9"$$

use 12" ϕ

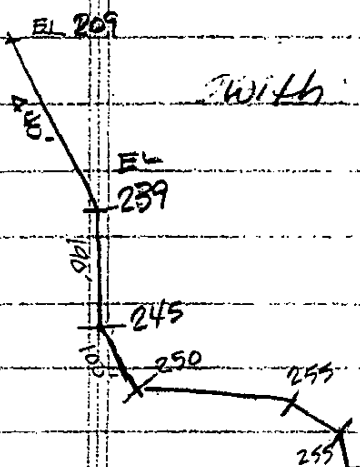
Waste Contact Subsurface & SURFACE DRAINAGE MUNDY LANDFILL

4/23/06
KUM

CD & T cell Waste Contact Stormwater Drainage pipe:

Recommend HDPE drainage pipe be placed along central valley between cells I, II, III and cell VI. (see following figure)

Total Length \approx 1100 ft (scaled)
use 12" perforated HDPE collection piping



With existing valley contours from north to south:

Slope₁ = $\frac{30}{440} = 0.068 \rightarrow \sim 6\frac{1}{2}\%$ Flows north

Slope₂ = $\frac{6}{190} = 0.026 \rightarrow 2\frac{1}{2}\%$ Flows north

Slope₃ = $\frac{5}{100} = 0.05 \rightarrow 5\%$ Flows north

Slope₄ = ~Flat (220') Flow North

Slope₅ = ~Flat (130') Flows North

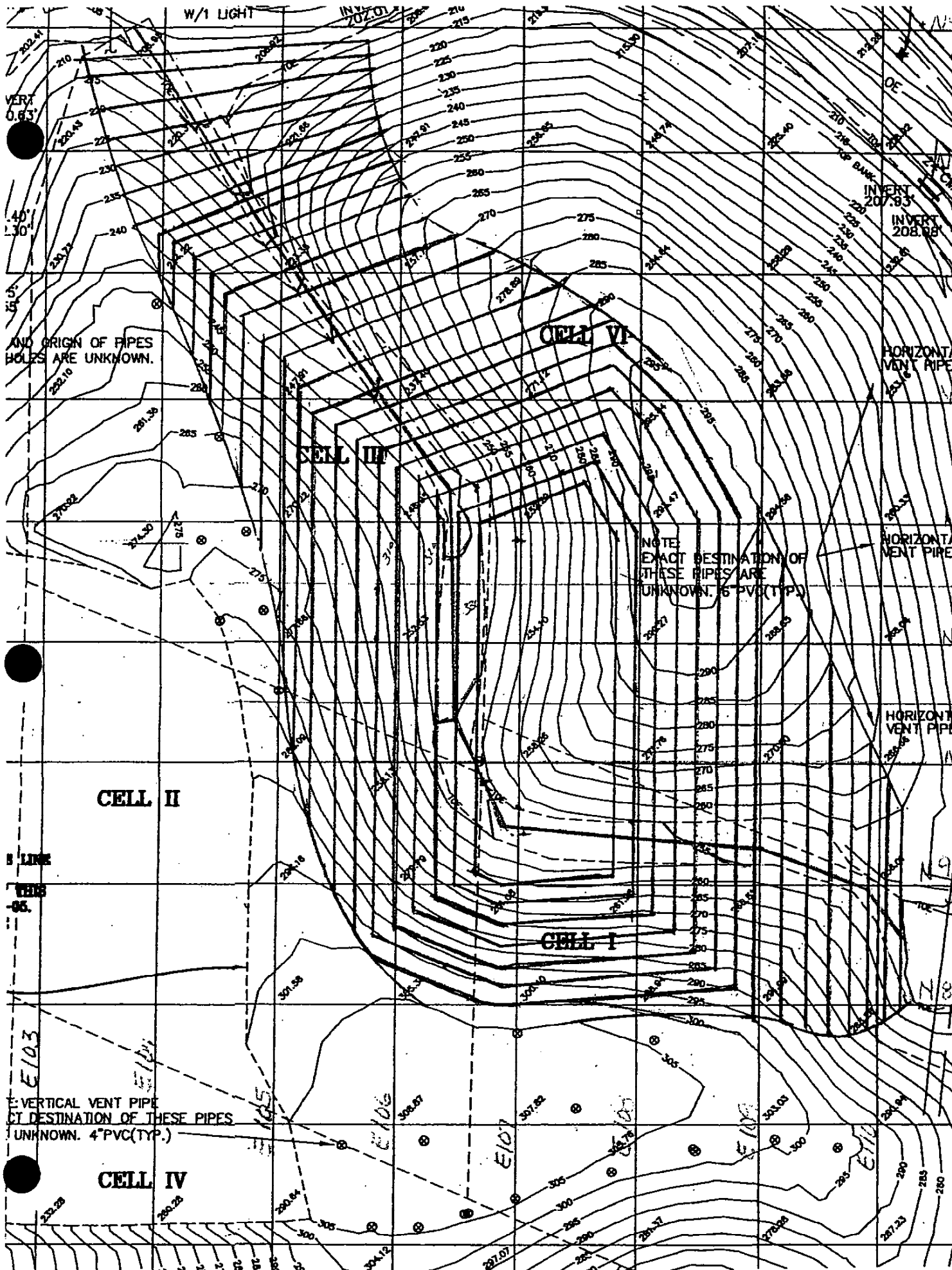
Constructed slopes can be increased if necessary.

Surface Drainage

The proposed CD & T cell will not significantly alter the existing drainage. After final cover, much/most flows directly toward the north holding pond.

The remaining surface water should drain toward the existing ditches that border Cell VI on the east and ultimately flow to the north pond - Use 12" of perforated HDPE pipe -

Gas System - the proposed CD & T cell will cover a significant portion (3.45 ac) of Cell VI. It is proposed that the CD & T cell be placed before the Cell VI final cover is put in place, i.e., the final cover for the CD & T cell will serve both (in the common area).



MUNDY CDW-N
DeSoto Parish

5/5/06
KLM

Contact Stormwater Pipe

Structural stability of pipe under max waste loads

Prism Load

$$W_{cd} = \gamma H B_c, \quad \text{where } W_{cd} = \text{load, \# / ft}^2$$

$$B_c = \text{O.D. Pipe, ft}$$

$$H = \text{CD Waste above pipe ft}$$

$$\gamma = \text{CD unit wt} = 65 \text{ pcf}$$

$$B_c = \frac{12.75''}{12 \text{ in/ft}} = 1.0625 \text{ ft}$$

$$H_{\max} = 330' - 250' = 80 \text{ ft}$$

$$W_{cd} = (65)(80)(1.0625) = 5,525 \text{ \# / ft}$$

Pipe Stiffness

$$P_s = \frac{4.47 E}{(DR-1)^3}, \quad \text{where } P_s = \text{pipe stiff, psi}$$

$$= \frac{(4.47)(30,000)}{(17-1)^3}$$

$$= 32.74 \text{ psi}$$

$$E = 30,000 \text{ (HDPE pipes)}$$

$$DR = \text{Dimension Ratio (17 for SDR 17 pipes)}$$

Deflection

allow. (safe) deflection: $\leq 5\%$ of Diameter

$$\Delta y_{\text{allow}} \leq (0.05)(12.75) = 0.6375''$$

$$\begin{aligned} \text{Est. Defl } \Delta y &= \frac{0.67 W_{cd}}{P_s + 0.41 E'}, \quad \text{where: } \Delta y = \text{deflec} \\ &= \frac{(0.67)(5,525/12)}{(32.7) + (0.41)(2000)} \quad \begin{aligned} E' &= \text{Mod Reaction trench mat'l} \\ &= 2000 \text{ psi} \\ &(\text{gravel-DR=70\% fines free}) \end{aligned} \end{aligned}$$

$$= 0.36 \text{ in} < 0.6375'' - \text{allow}$$

O.K

*Mundy Landfill
Modification No. 2*

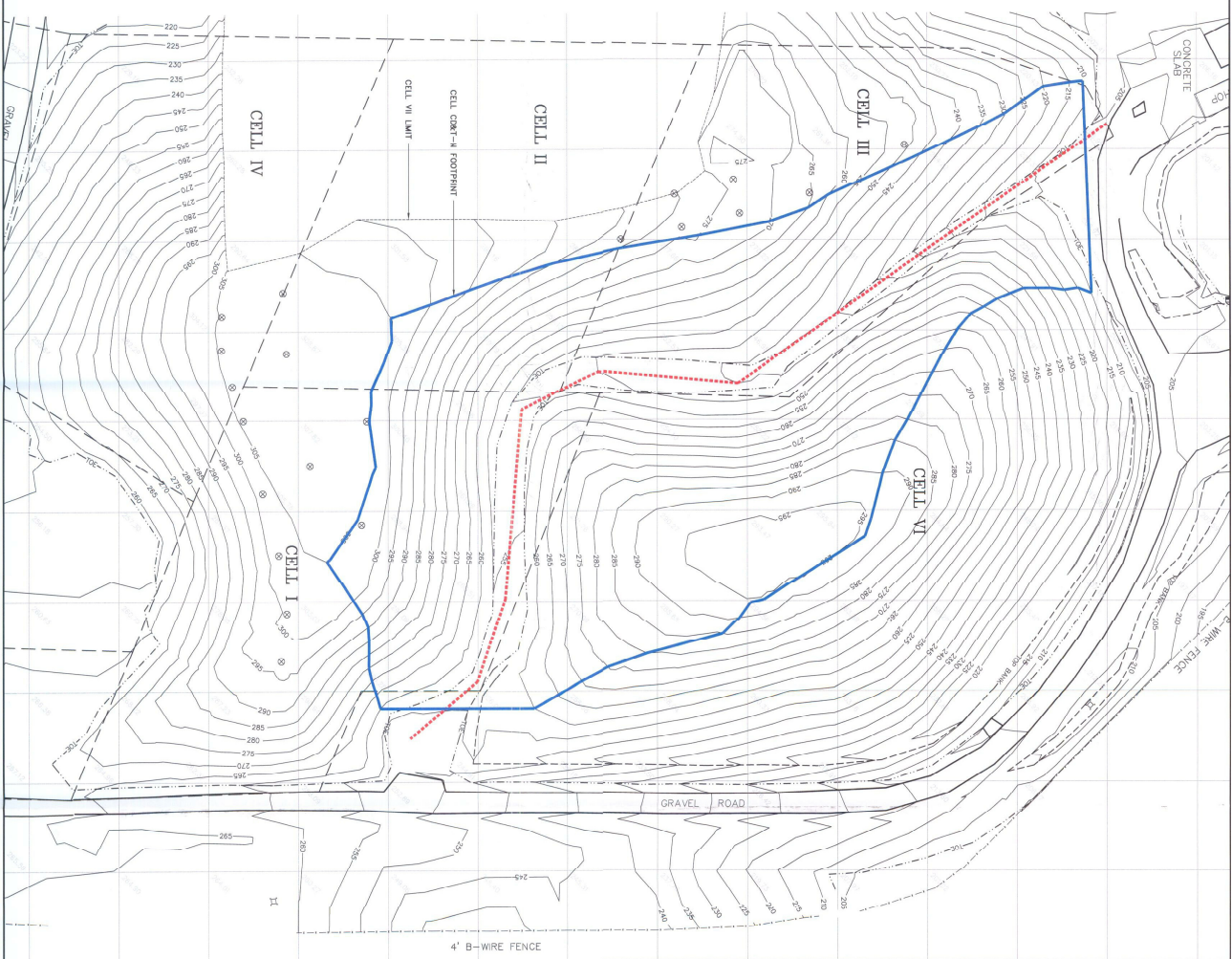
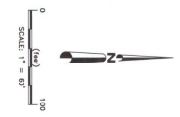
APPENDIX T-2

2006 PERMIT DRAWINGS

STE-T1	Bottom of Cell
STE-T2	Conceptual Bottom of Final Cover Contours
STE-T3	Conceptual Cross-Section: Station N92+50
STE-T4	Details

P:\2005\05-1157\cadd\051157-11_Existing_Landfill.dwg

Feb 08, 2007 - 9:54am



N99+00
N97+00
N96+00
N95+00
N94+00
N93+00
N92+00
N91+00
N90+00
N89+00
N88+00
N87+00
N86+00
N85+00

REFERENCE:
performed in November and December, 2005 by Pulsar
Services LLC.

- 250 — EXISTING CONTOURS
- — — ROADS
- — — CELL BOUNDARIES
- — — SPOT ELEVATIONS (feet, NGVD)
- ***** CONTACT WASTE STORMWATER DRAINAGE PIPE
- ⊗ EXISTING GAS VENTS
- CELL COAT-N FOOTPRINT

MUNDY SANITARY LANDFILL

DE SOTO PARISH, LOUISIANA

DE SOTO PARISH POLICE JURY

LANSHIELD, LOUISIANA

JONES ENVIRONMENTAL, INC.

SHERBOURNE, LOUISIANA

STE

Soil Testing Engineers, Inc.

Belton Ridge, LA, Jefferson, LA, Bossier, MS

Project Engineer: **David H. Jones**

Drawn By: **DHJ**

Check By: **DHJ**

File No.: **05-1157**

Date: **6-07-06**

Sheet No.: **STE-11**

BOTTOM OF CELL

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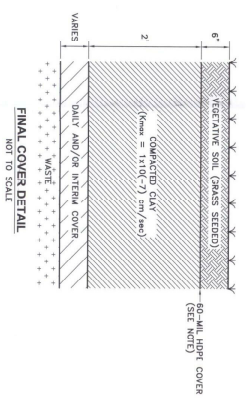
Feb. 08, 2007 - 9:21am



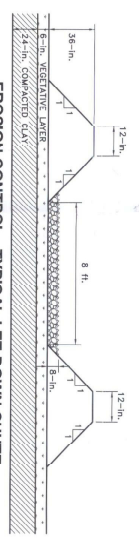
REFERENCE:
Survey work performed in November and December, 2005 by Poirs
Services, LLC.

- LEGEND:**
- EXISTING CONTOURS
 - ROADS
 - CELL BOUNDARIES
 - SPOT ELEVATIONS (feet, NGVD)
 - FINAL COVER CONTOURS
 - ⊗ EXISTING GAS VENTS
 - ⊗ PROPOSED GAS VENTS
 - CELL CD&T-N FOOTPRINT

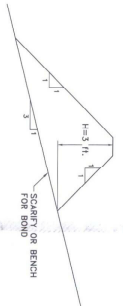
NOTE:
Final elevation contours, vent, and slope above elevation +330 ft. revised
by Dr. Ricardo de Abreu in 12/21/2006 and 02/08/2007.



NOTE:
60-MIN HDPE COVER WILL BE
INSTALLED OVER THE SLOPE FLATTER
THAN 3:1 TO PROVIDE THE SLOPE WITH
A COMPOSITE LINER SYSTEM.



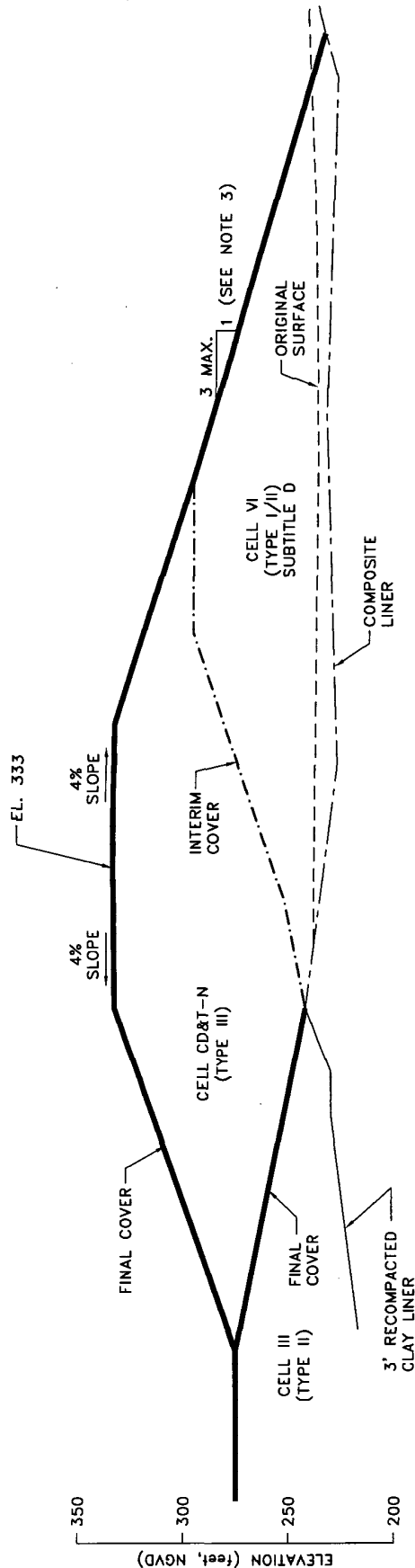
NOTE:
Minimum spacing between let-down
chutes = 300 ft. Location will
depend on actual final contours.



NOTE:
At least every 20 ft. in length, 1% minimum
chutes = 300 ft. Location will
depend on actual final contours.



STE	
Soil Testing Engineers, Inc.	
Baton Rouge, LA, Lafayette, LA, New Orleans, LA	
Project Engineer: K. McKinnis	
Drawing No.: 05-1157-06	
Date: 6-07-06	
Sheet: 12 of 12	
MUDY SANITARY LANDFILL	
DE SOTO PARISH POLICE JURY	
MANHELD, LOUISIANA	
JONES ENVIRONMENTAL, INC.	
SHREVEPORT, LOUISIANA	

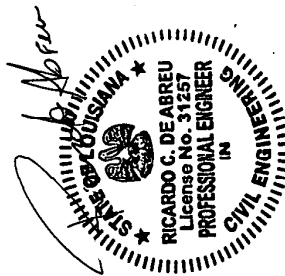


LEGEND:

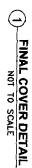
- FINAL COVER
- - - ORIGINAL GROUND SURFACE
- - - COMPOSITE LINER
- - - 3' RECOMPACTED CLAY LINER
- - - INTERIM COVER

NOTES:

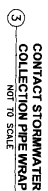
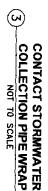
1. Reference East-West Cross-Section J-J', Sheet JEl-12 in Appendix Q of the 2004 Permit Renewal Application.
2. Cross-section taken at approximately Sta. N92+50.
3. Final slopes will not exceed 3H:1V.
4. Final elevation and top slopes revised by Dr. Ricardo de Abreu on 12/21/2006.



REV.	DATE	DESCRIPTION	BY
1	12/06	Top slope revised	RDA
MUNDY SANITARY LANDFILL			
DE SOTO PARISH, LOUISIANA			
for			
DE SOTO PARISH POLICE JURY			
MANSFIELD, LOUISIANA			
JONES ENVIRONMENTAL, INC.			
SHREVEPORT, LOUISIANA			
STE			
Soil Testing Engineers, Inc.			
Baton Rouge, LA Jefferson, LA Bossier, LA			
Project Engineer:		Drawn by:	Checked by:
K. McManis		DMS	
File No.:		Date:	Drawing No.:
05-1157		5-11-06	STE-T3
Title: CROSS-SECTION			



NOTE:
THE 60-ML HDPE COVER WILL BE INSTALLED OVER
SLOPES FLATTER THAN 1(V):4(H) WHICH OVERLIE CELL VA.



NOTE:
Final elevation, top slopes, and contact stormwater pipe detail modified by Dr.
Ricardo de Abreu on 12/21/2006.

1	12-02	Double 1 & 2 revised	500
REV	DATE	DESCRIPTION	BY

MUNDY SANITARY LANDFILL
DE SOTO PARISH, LOUISIANA

DE SOTO PARISH, LOUISIANA

DE SOTO PARISH POLICE

**JONES ENVIRONMENTAL,
SURVEYPORT 10131A**

ST

Jefferson, LA Biloxi, MS

DMS	✱
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